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ON THE NEXT GREAT ARCTIC DISCOVERY.*

THE BEAUFORT SEA.

By Sir CLEMENTS R MARKHAM, K.C B., F R.S

I THINK that the time has come for taking stock of our Arctic knowledge, and for deciding what work of importance remains to be done. For we are now able to take an intelligent and scientific view of the Arctic Regions, and to see exactly what remains to be discovered, and how the unknown parts would fit in and make the whole problem complete. Until lately we had before us many unconnected stories of discoveries in one direction or another. Now, thanks to the researches of scientific thinkers and explorers, each discovery is falling naturally into its place. We can see the whole grand edifice, and note what stones are wanting to make it perfect.

The discovery by Dr. Nansen of a polar ocean with a depth of 2000 fathoms, drew the veil from the Arctic mystery and made all things clear. That this ocean extends to and beyond the pole is shown by convincing evidence. The great harvest of ice drifting southwards between the track of the *Fram* and the east coast of Greenland must, of necessity, come from an area to the north of the *Fram's* track. Again, along the course of the *Fram*, at depths of 480 to 500 fathoms, colder water was found above that affected by subterranean heat, but beneath the overlying stratum of warmer water. It must have cooled down in the unknown Arctic basin, in contact with the cold surface water, in an area occupying most of the still unknown polar region. So that the deep polar ocean probably covers the greater part of the unknown area, and rising from such depths there can hardly be any land.

This polar basin is almost surrounded by continental lands, whence

* Research Department, November 13, 1905.

shelves, at no great depths, extend to the edge of the deep ocean where there is a more or less rapid descent. North of the New Siberia islands this descent is from 54 to 1050 fathoms in 40 miles. North of Spitsbergen it is from 90 to 630 fathoms in 30 miles. The width of the continental shelves is greater when extending from low lands, and less where the land is more steep and abrupt. Facing the low plains of Siberia the width of the shelf was found by Nansen to be 30 miles, and at the outer edge the depth was only 54 fathoms. The width of the shelf is usually only 40 to 100 miles in extent, beyond the outer line of land.

All undiscovered Arctic land probably rises from the continental shelves, just as all discovered Arctic land does. There can scarcely be any land rising out of an ocean with a depth of 2000 fathoms.

The question of the continental shelves and of the bathymetrical features of the North Polar sea has been considered in great detail by Dr. Nansen in his last volume; and his conclusions have been carefully summarized by Prof. Spencer in the April number of the *American Geologist* (vol. 35). My main object now is to bring their conclusions to the notice of English geographers.

We learn that all along the coast of Siberia, from Alaska to Franz Josef Land, the width of the continental shelf is nearly uniform, with a general depth of less than 100 fathoms. The soundings have revealed deep submarine valleys opening towards the polar sea. This, however, is not the case on the shelf along the Siberian coast. Nansen accounts for the absence of these valleys by the coast-wise distribution of sediment brought down by the great rivers, which has filled them up.

In the Kara and Barents seas there are many of these submarine ravines or valleys, and the whole bottom appears to have been elevated above the sea-level, probably at some not very remote geological period.

Spitsbergen and Franz Josef are on the outer edge of the shelf, there being a width of only 30 miles to the north before the deep ocean is reached. Here the depths are irregular, because the platform is cut by valleys running north from the Barents sea

We know much less of the width and depth of the shelf to the north of Greenland, Ellesmere island, and the Parry archipelago. We have the sounding taken by Sir Albert Markham at his furthest north, 30 miles from the land, in 70 fathoms. From the characteristic of narrow shelves in front of high lands, from the absence of land for 100 miles, and from the depth, Prof. Spencer infers that the edge of the continental shelf was here nearly reached by Markham, and actually crossed by Peary.

Nansen calls attention to the soundings in the channels of the Parry archipelago indicating that it was a region of typical fjords opening into the polar basin, which he considers is not very distant.

There are depths of 91, 220, and 270 fathoms. In Lancaster sound there is a fjord deepening from 130 to 330 fathoms. There is another deep fjord, trending to the polar basin, in Cardigan strait, with a depth of 400 fathoms.

Prof. Spencer looks upon the Parry archipelago as a high plateau region cut by valleys, and subsequently submerged in part. Judging from the depths in the submarine fjords, the shelf to the north would be comparatively narrow, not more than 50 miles. So that no land can be expected north of Prince Patrick island, or of the islands discovered by Sverdrup.

From the Parry islands towards the New Siberia islands there is an area probably occupied by a continental shelf; and this area is now the least-known part of the Arctic Regions, and the one which contains the most interesting geographical problems. Great part of it is occupied by a sea bounded on the south by the American continent, and on the east by the west coast of Banks and Prince Patrick islands. It has received the name of the Beaufort sea.*

Ever since I was serving in the Arctic Regions, more than fifty years ago, I have taken a special interest in the Parry archipelago,† and the region between it and Siberia. In my 'History of Griffith and Cornwallis Islands' I gave an account of the Silurian fossils which are so abundant, and also described the Eskimo relics which I and my shipmates met with while sledge-travelling. All along the southern shores of the Parry islands, facing Barrow strait, there are the remains of Eskimo encampments. I examined many myself, and collected relics. There were winter *iglus*, the stones showing summer tent places, fox-traps, scrapers, parts of the bone runners of sledges, and, what I thought most interesting of all, a long willow switch covered with lichens. Indeed, all the relics were more or less covered with lichens, showing their great antiquity. When M'Clintock, in 1851, found the bones of ptarmigan eaten by Parry in 1820, they were as clean as when first picked. In intense cold lichen is of extremely slow growth.

Two facts appeared to be clear to us—that the people who had thus left so many vestiges of their presence were moving eastward; and that the emigration took place at some very distant period. We naturally looked to the existence of a line of islands between our position and Siberia, along which they might have come.

* From American coast to north end of Prince Patrick island, 500 miles, south-west point of Prince Patrick island to Wrangel island, 950 miles.

† The Parry archipelago should include all the islands north of the American continent, except Baffin Land, North Devon, and Ellesmere island, which form a separate group opposite to Greenland. All the Parry islands were discovered by Sir Edward Parry himself, except King William island by Ross, and Wollaston island. The geographical positions of the islands discovered by Sverdrup place them in the Parry archipelago.

The late Admiral Sherard Osborn wrote an excellent article on the subject in our Arctic newspaper, the *Aurora Borealis*, which would have been worthy of a place in his collected works. Quoting from Baron Wrangell's book, he pointed out that there was actually a Siberian tradition respecting this movement of tribes. The Onkilon and Omoki, whose hearths were once as numerous as the stars of an Arctic night, had gone away over the ice, and had never returned. Their departure appears to have been due to pressure from more powerful tribes to the south. It was possible that the people whose traces we found might have crossed by Bering strait, and marched along the American coast and northward by the west side of Banks island. But it seemed unlikely that they would go from a more hospitable to a most inhospitable region. We preferred to think that they worked their way eastward, along unknown islands on the north side of what was afterwards called the Beaufort sea.

The journeys of M'Clintock and Mecham in 1853 along the western coast of Prince Patrick island, and the voyage of McClure along the western side of Banks island, gave us fresh information respecting the Beaufort sea. Prince Patrick island was reported to have a very shallow coast, with heavy grounded ice in the offing. Possibly this is an indication that the continental shelf extends so far north under a shallow sea, but the pressure on the coast seems to make it improbable that there is any more land to the westward in that latitude (76° to 77° 30′). Sherard Osborn edited Sir Robert McClure's book, and described the ice off Banks island to be of great age and thickness, with a surface of rounded hill and dale. Sir Richard Collinson made an advance of a day or two from the American continent, but found the ice so heavy that he was unable to proceed, and gave up the attempt.

This information respecting the Beaufort sea rather confirmed our belief in islands to the north of it to the south of 76°. The extraordinarily heavy ice off Banks island led us to think that it was the accumulation of ages, kept there by islands locking it to the north. In that case the whole of the Beaufort sea would be shallow and within the continental shelf, which would extend from 30 to 40 miles to the north of the supposed islands.

But a contemplation of the long line of heavy ice-pressure round the whole western side of the Arctic Regions, revealed to us by the expedition of 1875, raised a doubt in my mind whether the ice in the Beaufort sea was not part of the deep polar ocean itself, extending, in this part, to the edge of the shelf, 40 or 50 miles wide, in front of the American continent. In that case no islands could exist in the supposed positions.

Prof. Spencer points out the evidence derived from soundings, which shows that there are at least three submarine valleys or fjords intersecting the Beaufort sea in the direction of the polar ocean—one from the south, one from the south-east, and one from the east. It

must be remembered, however, that the number of soundings is very small. Many more are needed to derive any positive arguments from them. The Mackenzie river, after passing through its own delta, extends to a submarine valley 190 fathoms deep, cutting into the Beaufort shelf. In the channel between Banks island and the American continent there is a submarine valley with a depth of over 300 fathoms, also cutting into the floor of the Beaufort sea. In McClure strait between Banks and Melville islands there is a third fjord, with a depth of 280 fathoms as far as 200 miles within the line of the islands. Considerable depths in the submarine valleys point to a narrow continental shelf. Hence these three submarine fjords, entering the Beaufort sea from three different directions and with such depths, are rather indications of the proximity of the edge of the shelf to the American continent and to Banks island, which will be against a probability of land to the north.

On the other hand, the Beaufort sea may be comparatively shallow and ice-covered, the bottom forming a broad valley on the continental shelf, with deep ravines cutting its surface and leading to the polar basin between as yet undiscovered islands.

Dr. Harris, in a paper in the American *National Geographic Magazine* (June, 1904, vol. 15, No. 6), supports the view that there is undiscovered land to the north on the ground that the currents from Bering strait turn to the east and west. It seems to be a mistake to suppose that there are currents of any volume flowing east and west from Bering strait. The strait is too shallow to admit of any such entrance of volumes of water forming currents. The drift of the *Jeannette* was not caused by a current coming from Bering strait. Dr. Harris infers that there must be land north of the Beaufort sea which checks the northward flow of this supposed current from Bering strait. He also adopts Sherard Osborn's view that the ice, from being very old, appears to have no broad outlet, but only openings through narrow channels. Both Prof. Spencer and Dr. Harris concur in what I once said—that there is land between Prince Patrick island and Siberia. Prof. Spencer would limit its occurrence to a line directly connecting the two positions. Dr. Harris believes in a continental mass of land extending to the pole, but, as I think, on mistaken data. Any land in this part of the Arctic Regions will probably be found to consist of islands skirting the edge of the continental shelf. The drift of the *Jeannette* in 30 or 40 fathoms was well within the shelf, and there might have been land to the north, and nearer the edge, which would not have been visible to those on board her, although land was reported to the north more than once.

Mr. Mikkelsen has brought to my notice a point which I consider to be of considerable importance. He has pointed out to me that the drift of the *Jeannette* was at first half a mile a day, that it increased to

2·2 miles, and that latterly it was 3·2 miles a day. This makes it quite certain that the current does not come from Bering strait, for a current is not accelerated at a distance from its origin without some new force unconnected with that origin. The question arises, Whence comes this acceleration? and one naturally turns for an explanation to the Siberian rivers. But a current from that coast would have drifted the *Jeannette* to the north. In point of fact, her drift was longitudinal with little northing, until near the point where she was lost; when the drift had turned north. These facts certainly point to the existence of land to the north of the *Jeannette's* track, ending where that track turned north. At this point the *Jeannette* was 200 miles from the *Fram's* track in the same latitude, where the current only took the *Fram* half a mile a day, increasing further on to a mile. So that the phenomenon of an accelerated current experienced by the *Jeannette* had ceased before the current reached the *Fram's* position, while the northerly direction continued.

There is another consideration which might be held to indicate the existence of land in the unknown area, derived from the narrow character of the channel between Iceland and Greenland. If the whole unknown area is an ocean, the outlet for such a vast quantity of ice is too narrow. But a large part of it appears to be forced upon the northern shores of Greenland and the Parry archipelago.

The question of driftwood should have its due place in the argument. It was found by Parry at Melville island. Several pieces of decayed wood were found on the south coast of Prince Patrick island; and in a ravine Lieut. Mecham observed a large spar protruding from the bank for 10 feet, and 4 feet in circumference. Several parts of similar trees were just showing above the ground, one of them 30 feet long. On Eglinton island there was fossil wood.

On Ballast beach, the north-west coast of Banks island, there were great accumulations of fossil trees lying from the seashore to a considerable height inland. Layers of trees (*Abies alba*) were visible, obtruding from the rock. In one ravine there was a mass of wood for a thickness of 40 feet from the surface.

In Sir George Nares's expedition a considerable quantity of driftwood was met with on the beaches of each bay open towards the north west. The wood was only found near the margin of the sea and in the lake-beds. If left exposed it rots away, but when buried under the frozen muddy soil it remains undecayed for ages. On the eastern shore of Hilgard bay there were great quantities of drifted wood, in pieces varying from a foot to 15 feet in length. Some were 40 feet above the sea-level. Colonel Feilden had thirteen samples examined by Dr. McNab, who reported that eleven of them were coniferous, and two dicotyledons (*Populus*). He thought they were North American.

Sir Roderick Murchison was of opinion that, at the period of the

deposit of the Banks island wood, large portions of the Parry archipelago were submerged, trees and cones were drifted from the nearest land on which they grew, and eventually deposited on submarine rocks. Then there was a gradual elevation of the land, carrying with it the drifted timber.

It is much to be desired that we should be certainly informed whether the driftwood is of North American or Siberian origin, or whether it may be derived from both sources. Its existence in such immense quantities seems to point to the absence of any continental land which would have prevented its reaching the distant shores of the Arctic archipelago, though there may be islands near the lines of drift. At the same time the contrary current which caused the drift of the *Jeannette* seems to preclude the possibility of the driftwood having come from Siberia.

Let us now turn for a moment to a general view of the whole circumpolar region, to see what position is held by the part which we have been specially considering.

The islands on the continental shelf and the bordering lands must be looked upon as comprising the whole of the terrestrial Arctic Regions, and geographers should look upon problems connected with those regions from that point of view.

Dr. Nansen has described the Arctic continental shelf in much detail. Prof. Spencer has turned his attention mainly to the valleys and ravines by which the shelf is intersected, as revealed to us by soundings.

It is a subject full of interest in many branches of scientific inquiry. On the Siberian side the shelf is described to us from careful personal observation by Nansen. We see the group of New Siberia islands and Bennett island rising from it, with their mammoth ivory and cliffs of fossil wood. We then contemplate the land masses of Novaya Zemlya, Franz Josef, and Spitsbergen, rising from the Kara and Barents seas, with the marvellous tale they tell of the former condition of the region in recent geological times. Next, on the further side of the great southerly ice-stream, is the continental mass of Greenland with its glaciation, only surpassed in grandeur and extent by the Antarctic ice-field. Then the somewhat analogous land masses of Baffin and Ellesmere islands, with the separating straits and channels. Finally, the intricate Parry archipelago to the north of the American continent. These lands, bordering on, or rising from the continental shelf, form the Arctic Regions as we know them. But between the Parry archipelago and the Siberian shelf there is, as has been shown, a vast area in and to the north and north-west of the Beaufort sea of which we know nothing. I have referred to the reasons that have been adduced for thinking that it may contain land, and land of great interest, and also to the reasons against that hypothesis. Knowledge of the Arctic

Regions will remain very incomplete until this area has been discovered and explored. It is one out of several geographical undertakings that call for attention, and one of the most important.

I should like to see the *Discovery* rented from the Hudson Bay Company, and stationed in a secure harbour near the mouth of the Mackenzie for two winters, or still better, at Melville island. She should be manned by British seamen, not fewer than enough to form three extended sledge-parties, and three depôt parties. The object should be to explore this unknown section of the continental shelf over the Beaufort sea as far as the edge of the polar ocean. Each sledge must carry sounding line sufficient for any depths likely to be found over the shelf, but not, of course, for deep-sea sounding. The nature of the ice surface, as described by McClure, appears to be difficult for sledge-travelling, but not insurmountable. The ice is probably, to a large extent, stationary. If the journeys of M'Clintock, Mecham, or Scott are laid down from the proposed winter quarters over the Beaufort sea, it will be seen that they will reach the probable position of the edge of the polar ocean, and will thus lead to the discovery of any possible land.

This geographical achievement is the proper work of the Government. If our rulers continue to neglect a duty so deeply felt and so well performed in the days of old, it should be advocated by a great society. Meanwhile geographical enthusiasm cannot be repressed. It begins to be seen that this is the chief Arctic work that remains to be done, and young aspirants are coming forward. Yet the risks are great with small and insufficient means.

Mr. A. H. Harrison is the first in the field. He has gained the Society's Diploma. He has carefully studied all the existing literature on the subject. He has considered his plans with reference to his means. He has not asked for any aid from the Society. He is entering upon a most hazardous and difficult enterprise in the interests of geographical science, and he deserves all the encouragement and countenance we can give him. Mr. Harrison will make an attempt to reach Prince Patrick island, and to traverse part of the Beaufort sea, in the hope of discovering land.

We have another aspirant in the person of an enthusiastic young Dane, Mr. Einar Mikkelsen, who served with Amdrup on the east coast of Greenland, and in the Baldwin-Ziegler expedition. He has carefully studied all the literature on the subject, and appears to be in a fair way to obtain sufficient funds. He intends to descend the Mackenzie river and meet a whaler by previous arrangement. He will winter at the south-west point of Banks island, having previously established a depôt at Prince Alfred cape. In the early spring he will work westward for 100 miles from Prince Alfred cape, and then return southward to the mouth of the Mackenzie, with the object of discovering land if

it exists. His party is to consist of three, himself included, and he calculates on aid from the Eskimo If he discovers land, he intends to return at once without attempting to explore it, in order to report and organize a more efficient expedition.

The expeditions of Harrison and Mikkelsen involve great hardships and difficulties, as well as serious risks, owing to the very limited scale on which they are necessarily planned, and to insufficient funds. But, like the writings of Prof. Spencer, they point correctly and unerringly to the next great exploit that is needed in the interests of polar geography. I have never encouraged enterprises unless the advantages to be gained are in proportion to the risks to be encountered. I believe that in this case the results to be sought are of the highest geographical importance.

I am far from committing myself to a decided opinion on any of the points that have been discussed. During the summer a friend of mine, Sir Harry Vernon, sent me a volume, by General Sir Rufane Donkin, on the course of the Niger, taking it through Lake Chad to the greater Syrtis in the Mediterranean. It is a very learned treatise, and was published in 1829. The true course and mouth of the Niger were discovered in 1830. Geographical facts upset all the general's learned arguments derived from Herodotus, Ptolemy, Edrisi, and Abulfeda, almost before his ink was dry. It must have been mortifying. It is certainly a warning never to be over-positive in geographical speculations. I have endeavoured to avoid this pitfall, and to confine myself to a review of what we know, and to a suggestion of the most probable solutions from the actual data in our possession. But our knowledge is incomplete, and the more incomplete it is on certain points the more urgent it is that the truth should be sought for and discovered.

There is other valuable work in the Arctic Regions—such as the complete examination of the east coast of Greenland, contemplated by Mr. Mylius Erichsen; and the exploration of Baffin island and its great inland lakes, to be undertaken by the Dominion Government. But the only great discovery that remains to be achieved lies over the continental shelf of the Beaufort sea.

APPENDIX.

MR. EINAR MIKKELSEN'S PLAN.

In order to ascertain whether there is land to the north of Alaska or not, I have, with two or possibly three companions, decided to make an attempt to explore the Beaufort sea. My partner and companion, Mr. E. Leffingwell, has considerable experience in Arctic work, and Mr. E. Ditlevsen has travelled in Greenland. The possible third companion has also experience in that kind of work. Our plans for working are as follows. Mr. Leffingwell, geologist, Mr. Ditlevsen, naturalist and artist, and probably a third man, will leave Athabasca landing in the latter part of May (1906) *en route* for the Mackenzie river, to descend to the polar ocean. Thanks to the steamers which run on the Mackenzie river, and to the Hudson Bay

Co.'s kindness, the ocean will be reached in the latter part of July. The party will there do what scientific work there can be done in the space of time—about a month between their arrival and the arrival of a St. Francisco whaler, which will bring me and supplies around. I myself will go with the whaler through Bering strait, for the double purpose of making hydrographical investigations in the Bering sea, Bering strait, and the polar ocean to the west and east of the strait, in order to ascertain whether any water from the Pacific enters there or not—a question which it seems very desirable to get settled—and in order to purchase a pony or two on the Siberian coast. I shall endeavour, also, to get my pack of dogs at different native settlements, as that would ensure me getting a better pack than in buying them all at one place.

About August 8 the whalers leave for the Alaskan coast, and usually about the latter part of August they reach the mouth of the Mackenzie river. Here my party will be picked up, and we proceed eastward to Cape Bathurst, where I shall endeavour to get a couple of suitable Eskimo.

If the sea-going whaler cannot be persuaded to go across to Banks Land, our provisions and gear will be shipped on board a small schooner, which cruises in the waters between Cape Bathurst and Banks Land. In this schooner we shall endeavour to reach—which the frequent visits of that whaler in Banks Land ensures me is possible—Cape Nelson, or, better still, Cape Kellet. At our landing-place all our gear will be unshipped, and the vessel will at once depart southward.

A boat brought up by the whaler, and capable of carrying three to four tons of provisions, will be loaded, and a party will leave with it in order to place a depôt on Cape Prince Alfred, or on the islands off the coast. If time permit, the party will stay there in order to get and cache some game, which will enable us to stay a short time at the depôt the following spring without wasting any of the sledge provisions. The party will then depart southward. The two men left at the camp will meanwhile have worked at getting the camp into shape, so that we can at once begin taking observations. The geologist and naturalist will make as extensive a collection at this place as possible. As extensive meteorological and magnetical observations as possible will be kept up during the winter.

Early in the following spring, the middle of February, the entire party will start northward to the depôt. Arrived at this place, the sledge party—Mr. Leffingwell, myself, and a third man (probably Mr. Ditlevsen)—will start out on the ice, helped over the broken up land-ice by the fourth man and the Eskimo. As soon as the party to proceed can help itself, the assisting party will depart southwards, *en route* for Cape Bathurst, Fort McPherson, to reach Camden bay, there to await the further-going party. The sledge-party will start with thirty dogs and one pony, and will be able to carry provisions for about 132 days. Means for soundings too will be taken probably in the form of strong silk thread of a certain length (150 yards). There will, too, be carried some small weights from 1 to 2 ozs. By these means we shall be able to find the bottom to about 100 fathoms. If deeper soundings would be desirable, the empty provision-tins, crammed together, will afford sufficient weight. This means of sounding is, of course, extremely insufficient, but it enables us to see, anyhow, whether the edge of the continental shelf is crossed or not. We shall endeavour to follow a west-north-west direction to about 76° 30′ N. lat. and 147° W. long. This distance is about 310 miles, and leaves about 380 miles to the nearest coast on the Alaska (Camden bay). If the ice encountered is good, we shall, instead of striking the Alaskan coast, endeavour to reach Wrangel Land, which distance is only about 200 miles longer. The results obtained, if the latter plan can be carried out, is much more satisfactory, but that must depend on the condition of the ice.

If land is found, we shall only carry out a rough survey, and devote our time to ascertain how big in extent it is, in order to judge the importance of the discovery, so as, on our return to civilization, to organize a more efficient expedition. Even if land is not encountered, the results of the expedition will by no means be negative, as we shall be able to ascertain approximately the extent of the continental shelf, and so, if the theory still is held that land exists to the north of the Alaskan coast, to have restricted the area of search.

Besides the sledge journey, we shall achieve results in the following branches: *Geology* and *zoology* at Mackenzie river and Banks Land, and the place where we strike land after the sledge journey; *ethnographical* investigations, wherever Eskimo or remains of them are found; *hydrographical* observations in and about Bering strait; and *meteorological, magnetical*, and *tidal* series during the winter stay on Banks Land.

EINAR MIKKELSEN.

Before the paper, the CHAIRMAN (Sir THOMAS HOLDICH) said: I think I shall be echoing your sentiments as well as my own when I say that we greet Sir Clements Markham here this afternoon with great cordiality. We are exceedingly glad to see him amongst us, not that any of us have the least doubt about his undying interest in the affairs of the Society, but that we are glad to see him well enough to come out on a day like this to address us on this the first meeting of this session; and as he is on ground which we may call peculiarly his own, I think he cannot fail to give us a paper which certainly will be full of interest, and which will, I hope, lead to valuable discussion afterwards. I will ask Sir Clements Markham to read his paper.

After the paper, Admiral PARR: As Sir Clements Markham has mentioned the subject of driftwood, and referred especially to the driftwood in the expedition of 1875-76 with Sir George Nares, I thought it might be of interest if I brought up a specimen, which I think is one of the most interesting specimens that were obtained, and why it arrived at the position it occupied we were never able to ascertain, and I have had no explanation up to the present of how it got to the position in which it was found. Perhaps I might just read what Sir George Nares said in his official report, when he first came back, with regard to driftwood—

"The few pieces of driftwood, all of the fir or pine species, that have been obtained on the shores of the Polar sea, have evidently drifted into the position in which they were found from the westward. One piece was obtained lying on the surface of the sea-ice itself, 2 miles distant from the land; the rest were found on the shore at different heights above the sea-level of 150 feet. The former was perfectly fresh, with the bark on; the latter in all stages of decay, usually embedded in the mud of dry ancient lakes, evidently formed by the rising of the land, and of very great age."

It seemed to me that the reason why so little comparatively fresh driftwood was found in our expedition was that the bays between the *Alert's* winter quarters and Cape Josef Henry were all practically blocked by permanent ice, and in the front of many of them were floes similar to those referred to by Sir Clements Markham as existing at Banks island, namely, those domed floes which it was almost impossible to walk over, the domes being formed of hard slippery blue ice, and if it were blowing, you had to get across them as best you could, crawling along, because it was impossible to walk. All the bays being closed by this permanent ice, the driftwood would have had difficulty in getting in. But this particular piece, which Sir George Nares referred to as being picked up 2 miles from land, was found by my sledge crew on one of the first journeys that we took,

lying on the surface on one of the very thick floes. The floe must have been, I suppose, 80 feet thick at the very least, and this was lying on the surface without being sunk in at all, and towards the middle of it. I was not with my crew when they picked it up, but, following them afterwards, I came to the spot, and picked up the bark, which they had not thought necessary to take with them; and here is a portion of the wood. It was perfectly fresh at the time it was found, with the bark on it, and about 2 feet long, probably a bit of branch not quite straight. Well, how that piece of driftwood got into that position has been a mystery to me ever since. We never were able to find out.

Sir CLEMENTS MARKHAM: How far was it from land?

Admiral PARR: Two miles, and on one of those very old floes which could never have got close to land unless there was deep water, and, of course, it could not have got that piece of wood on it anywhere within hundreds of miles of where we found it. Then, in addition to that, Sir Clements has mentioned the migration of the Eskimo, and I thought it might also be interesting if I brought here an Eskimo relic, which I think is the most northern that has ever been obtained. It was picked up just to the south of Cape Beechey, in 81° 52′, and at that spot we found Eskimo summer encampments, while further south we found their winter ones; but that was the most northern point at which any traces of Eskimo were discovered. These are other pieces of wood which were picked up on shore.

Sir CLEMENTS MARKHAM: Is that driftwood or pieces of wood belonging to the Eskimo?

Admiral PARR: They were picked up on shore, where I cannot say definitely, but somewhere near the winter quarters. But they are all very extensively withered, while this which was picked up on the floe was perfectly fresh.

The CHAIRMAN: Is that poplar or pine?

Admiral PARR: This, I imagine, is poplar—I think it is one of the poplar specimens, but I am sorry I have not any bark. Colonel Feilden had it cut up after he returned home, and he sent me this piece to keep.

The CHAIRMAN: Perhaps Mr. Mikkelsen will say a few words.

Mr. MIKKELSEN: I think I have already told you all I have to say. I have decided to take one pony instead of going with dogs alone.

The CHAIRMAN: Where are you going to get your pony?

Mr. MIKKELSEN: Siberia. In addition to the food we carry ourselves—we have at least 250 lbs. of meat—the pony can draw at least 800 lbs., and it eats in 20 days about 250 lbs., that leaves 550 lbs. clear after we have been out 20 days. I have tried ponies in Franz Josef Land, and found them very good indeed. And then, instead of going down to Mackenzie river, I intend to go with a whaler, and try and do some work in the Bering strait. It seems desirable to get some work done there. I don't think I can say any more.

The CHAIRMAN: I am sure all the company here wish you every success.

The CHAIRMAN. We have a letter written to Sir Clements Markham by Admiral Markham, which you might like to hear.

"I have read your paper with the greatest interest. It is an admirable and well-thought-out plan of campaign, and I am thoroughly in accord with all you have put forward. It is, as you state, quite time that we interested ourselves in a renewal of Arctic research, for it is just thirty years ago since we sent out our last expedition! Other nations have, however, not been idle during that long period, and much good work has been done. It is now time to take a broad and general view of what has been accomplished, to dovetail together the results that have been achieved, and then, as you say, to see exactly what remains to be done in

order to increase our geographical knowledge of the North Polar Regions. If Arctic research is to be renewed, then comes the important question as to the best locality for an expedition to be sent in order to obtain the most valuable and the most important results. I am certainly in favour of the scheme which you suggest, namely, to that large unknown area lying to the north and the north-west of the Beaufort sea. We all know that ice—and very heavy ice—will be encountered in that neighbourhood, but a sailing ship has already successfully forced her way through it, and I see no reason why a steamer should not meet with equal success. And we will, of course, hope that, unlike the sailing ship, the steamer will have a better opportunity of extricating herself when the work is accomplished. The theory that you have raised regarding the continental shelves of polar lands is exceedingly interesting, and may, or may not, be evidence of the existence of a large polar basin to the north, a basin in which no land is to be found. I must candidly confess that my own view was that if we could penetrate into the unknown area, we should, in all probability, find an archipelago, of islands, similar to those further south, extending towards and across the north pole. This opinion of mine —long formed—was somewhat rudely shaken by the report brought home by Nansen of the discovery of the large polar basin in which the *Fram* drifted for so long. You refer, in your paper, to the soundings I obtained in my highest latitude; that was, to my mind, at the time, conclusive evidence of the existence of land to the northward, and it was only Nansen's discovery that temporarily shook my faith regarding the existence of an archipelago. I was also much puzzled by the difference—the very great difference—of the conditions of the ice met with by me and by Nansen, for, whereas the ice over which I sledged varied in thickness from 80 to 120 feet, Nansen never encountered ice of a greater thickness than from 15 to 25 feet! I conjectured that the ice over which I travelled had been formed and held for long years in channels between islands to the north. I am, therefore, inclined to adhere to my original views that land, not continental, but in the shape of many islands, will be found to the north and north-west of Greenland. You have warned us not to be over-positive in geographical speculations, and I put forward this view with all due reserve. An expedition, however, such as you have suggested in your excellent paper will very materially assist in solving this interesting question."

Mr. Ravenstein: I have never made the Arctic Regions a subject of special study, but I may say that I have listened with great pleasure to Sir Clements' paper, and am very glad to see that he comes back to his first love in his old days. If we look at a map like the one before us and see the immense space which is there covered by the Beaufort sea, we must see that this is a region which ought to attract explorers, and I am very glad to hear that two gentlemen are going to try their luck, and I do hope Sir Clements Markham will live long enough to induce the British Government to send out an expedition, and if not the British Government, perhaps the Japanese will.

The Chairman: Before asking you to join in thanking Sir Clements for his very able paper, I should like to ask one comprehensive question. As he has taken a very comprehensive view of the whole of the North Polar Regions, I should like to know whether—gathered from the evidence of all the different explorers, ancient and modern, who have wandered across those northern seas—it can be said distinctly that the ice of the North Polar Regions is diminishing. So far as I gather from the results of the *Discovery's* voyage towards the south pole, the glacier ice there is distinctly receding, and the volume of the ice generally appears to be diminishing. One would imagine that the Southern Polar Regions are in process more or less of desiccation. It would, therefore, be exceedingly interesting

to know—especially with reference to what Sir Clements has said about the migration of tribes up in the north and the existence of driftwood, which seems to point to a somewhat different climate in past times—whether the ice there is increasing, balancing, as it were, the decrease of the ice in the south. Beyond that, I fear that my knowledge of North Polar Regions does not justify me in making further remarks on so very able a paper as the one that our late President has given us.

Sir CLEMENTS MARKHAM: In the Arctic Regions we only have very small areas comparatively of inland ice. We have Greenland, some portions of the land opposite Greenland, and some portions of Franz Josef Land, but all very small areas compared with the Antarctic Regions, and the Parry archipelago is not laden with ice, so that it would be difficult to say whether the ice is receding. I believe it is not receding, so far as Greenland is concerned. But there seems to be evidence that the land is rising. In Banks island the wood was found at a very considerable height above the sea; I think, more than 100 feet. What was the height, Admiral Parr?

Admiral PARR: 150 feet above the sea.

Sir CLEMENTS MARKHAM: So that there seems to be evidence that the land is rising round the shelf, although Nansen discovered an immense depth more in the centre of the region.

Admiral PARR: I think the glaciers in Ellesmere Land, if I remember rightly, were decidedly receding. There were two glaciers which came down glacier valley, and there were moraines some distance below where the glaciers extended then.

Sir CLEMENTS MARKHAM: In south Greenland the ice comes down and it breaks off in bergs. But I do not know of any direct evidence of the ice having receded.

Admiral PARR: I think at Foulkner fiord the glacier was also receding; that was on the Greenland side, but it was some distance from the sea, and had not discharged into the sea for some time. But further north the Humboldt glacier and Peterman glacier were still discharging into the sea.

Sir CLEMENTS MARKHAM: They are still discharging, but they may possibly be receding.

Admiral PARR. They may be.

The CHAIRMAN. The land of permanent ice is not coming southward?

Sir CLEMENTS MARKHAM I think not. The most puzzling point connected with the paper I have been reading is certainly the driftwood—where it comes from. If it is not Siberian, it must come from that American coast, and how it can possibly get round to Grant Land is a most puzzling question. It probably may find some currents round the Polar Regions, but there is an enormous quantity in Banks island, and in Prince Patrick island especially there is a great deal of wood.

The CHAIRMAN But none of the wood shows signs of an axe?

Sir CLEMENTS MARKHAM. I have never heard. After the migration of those people along the coast of Parry islands, they appear to have separated on the entrance of Wellington channel one set went down Lancaster sound and established themselves on the west side of Baffin's bay, and the other went up the channel, crossed Greely fiord, and were found by Admiral Parr and his shipmates far up Smith sound, then they appear to have followed down Smith sound. It is quite certain that the people, who were called Arctic highlanders, always had a tradition that they came from the north. For instance, they had no musk oxen, but they had the name, and they knew they had once had them. And there was certainly no communication between those people and the Eskimo in South

Greenland, none whatever, so that that is a distinct proof that they have come some great distance from the north and west.

The CHAIRMAN: That leads to the presumption that the north was warmer than it is now.

Mr. MIKKELSEN: I should like, if any gentleman present can tell me, to know where all that ice goes. If the polar ocean is like what it looks on the chart, where all that ice is going to seems to be a puzzle.

The CHAIRMAN: I have only to ask you to join in a hearty vote of thanks to Sir Clements Markham for his paper this afternoon.

THE LATE BARON VON RICHTHOFEN ON ANTARCTIC EXPLORATION.*

THIS is a memoir on the objects of south polar exploration by the late Baron Richthofen, which was left unfinished at the time of his lamented death. The great geographer stood in the very first rank among living cultivators of our science, and any words that come from his pen, more especially when they are practically his last words, will carry great weight. We find him, then, in these last words, in eloquent sentences which, alas! remain unfinished, dwelling upon the great importance of Antarctic research, not only from a scientific point of view, as adding to the sum of human knowledge, but also from a practical point of view. His interesting remarks will serve as a reminder that much work still remains to be done, and that for researches to be complete they must be continuous. It is discreditable that this country should be contented to see one great success achieved, and then drop the subject for half a century. If the great and important work which Baron Richthofen was engaged in describing when he was called away is to be completed (and it ought to be completed) there must be continuity—continuity of purpose and continuity of aim.

After describing the great difficulties and the results of the German Antarctic Expedition, Baron Richthofen offers a generous tribute of praise to Captain Scott and his fellow-explorers. He then refers to other expeditions. But the important part of his memoir is devoted to the results of Antarctic exploration, and this remains unfinished. The completed portion is well deserving of close attention, because it points to the necessity for continuity of effort. The following extracts will justify this conclusion.

C. R. M.

"The desire to seek out and to understand the scientific causes of phenomena, and to increase the sum of human knowledge, is a great aim. This is what led to the despatch of the German and English

* 'Ergebnisse und Ziele der Südpolarforschung,' von Ferdinand Freiherr von Richthofen (Berlin, 1905).

expeditions. Numberless problems offer themselves. The first is the form of the Earth. A great international work was undertaken for measuring the world with the most perfect methods. This will soon be completed as regards Europe, as well as Asia and Africa. But the work must remain imperfect without exact knowledge of the polar regions.

"The discovery by Nansen of a very deep ocean in the Arctic area is of the greatest importance. The Arctic expeditions leave no doubt of the existence of a great and lofty continent in the far south. This throws full light on other questions, and brings into order what was already known of the globe. An ocean is presented to us in the north polar region, surrounded by a ring of land. This land collects, during the summer thaws, a great quantity of ice, which in the course of centuries becomes a still-increasing mass, while a current keeps the way open between Europe and Greenland. This is the cause of the difficulty of navigation—the packing of ice, the floes, and the many hindrances to reaching the north pole.

"At the south pole lies a continent surrounded by a great ring of water. Gigantic masses of tabular ice come from the continent, and slowly melt. So here is a great problem with reference to this difference between the north and the south poles.

"All these questions, which continually increase, have been touched, but not answered. . . .

"There are also geological problems. The ice contains stones brought from some Antarctic continent, and is often full of them. When the ice melts, these stones, often great blocks of them, sink to the bottom of the sea. Sometimes they are found in dredging-nets. The greater part of them belong to very early formations, but they are mostly in small pieces. The geologist of the *Gauss* found a great number. If remains of land plants and land animals are found, we have evidence that there was formerly a land with a different climate. The Swedish expedition found fossils both of plants and animals. But large collections are needed to enable us to come to any certain conclusion.

"Among problems to be solved are the relationship of the present fauna and flora in countries far removed from one another; for example, New Zealand and South America. It may be expected that traces of communication will be found in the Antarctic Regions.

"The glaciation round the poles claims the first interest of the inquirer. Everywhere a steep cliff of 30 to 40 metres in height is encountered in the south. The table-shaped plateaux spread over an area of several hundred square kilometres of flat surface, extending from 200 to 400 metres beneath the sea. Pieces of the cliffs escape and float away, until they attain a great eastern distance, drifting with the current. When winter comes they are imprisoned in the ice-floes.

"It is already known that the south polar ice-drift is of great

extent. Information on this subject is now collected and shown on maps. As the ice melts pools of water form, very poor in salt, but of great importance for organic life. The ice-floes extend to the high land, and there remain fixed. The stones they contain is a proof that they must have been attached to the land. In the structure of the tabular masses lies the history of the ice, and only in our day have we learnt how to direct questions to Nature on this subject. In working out the materials collected, results of interest will probably be obtained.

"We can guess that the greater or less heaping up of ice round the poles may explain the phases of changes in the climates of the world. We know, from careful observations, that the beautiful heights of our Alps already show that their ice-covering is diminishing. The same thing is taking place in the Andes of Ecuador and on Kilimanjaro. In the Arctic Regions the recession of the ice has also been noticed. When from this we conclude that there is now less precipitation, that view is supported by the continual desiccation of Africa and the interior of Asia. A few remains of forest, and an ancient tree here and there, bear witness that there was at one time a damp climate. The trees disappear, and no new ones grow. All points to a general drying up.

"It is now an important question whether this is also the case in the Antarctic Regions. Is this withdrawal observed there, or is it different from what has been observed in the north?

"The Frenchman Adhémar, sixty years ago, sought to prove that ice-action, at both poles, changed in cycles; that in the glacial ages the ice extended from the Scandinavian interior ice to the Risengeberge, and the north pole was ice-covered, while at the same time the south pole was comparatively free, and that in our day this is reversed. We now think that this was not the case, but that probably the whole globe, in the glacial age, was cold and desolate.

"These questions can now only be solved at the south pole. At a spot visited by Ross there were exact observations. They show that the ice-edge of Ross is now thirty miles further south than it was in his day, and that the glaciers of Victoria Land have gone far back. In Ross's time the glaciers reached the sea, but they no longer do so. The German Antarctic Expedition discovered traces of glacier recession on Gaussberg. It was necessary, in order to determine the rapidity of this recession, to decide the present position of the ice by measurements, in order that future observers may be able to ascertain changes that have taken place in an interval of a few years.

"So far as we can judge, this retirement of the ice-cap is of the highest importance for future generations. Still, at any moment changes of an opposite character may take place; and to recognize the changes certain lines are necessary, such as were fixed at the Gaussberg.

"Another class of observations has reference to the polar oceans: their depths, the quantity of salt and gas they contain, their temperatures

and currents on the surface and at various depths, as well as the influence of floating and melting masses of ice. Knowledge of the sea is a great and special branch of scientific inquiry, and the methods of conducting it are becoming more and more perfect.

"These researches may be undertaken for their own sakes. Still, they lead to results of great importance, not only with regard to a knowledge of the ocean, but having reference to practical consequences which touch more and more on domestic life. Far-seeing researches in recent years show that the changes in the distribution of ice, and the currents in the sea round Greenland, have an important influence on changes of climate in Germany. The time does not appear to be distant when it will be possible to predict the character of the seasons months beforehand. This is only the beginning of the practical use of these researches. The more scientific use of the seas as fisheries will also be of great importance.

"Here, in an unexpected way, the practical value of polar research shows itself, by opening a wide view of the life-conditions of plants and animals. In former days men carelessly enjoyed the treasures offered to them by this apparently endless scene. Since then there has been great destruction, and now the rational use of the sea has become a problem of importance. Just as agriculture has made great strides in a knowledge of the cultivation of plants, so now we must turn to the sea for supplies.

"The progress made in a short time in this direction is prodigious. Now all the higher and the lower animals are seen to depend on each other, even to the smallest animal organisms, and these, again, need their food. The plankton discoveries show plant-like organisms of microscopic size which flourish on the surface of seas, sometimes in great quantities, while sometimes there is none. The curious fact is that those means of nourishment do not, like land plants, flourish best in the tropics, but, on the contrary, in the coldest polar seas, or where cold currents flow from them. In many places the sea is coloured green from this plant life——"

TRAVEL AND EXPLORATION IN THE SOUTHERN JAPANESE ALPS.*

By the Rev. WALTER WESTON, M.A.

THE islands of the Japanese archipelago—likened by the fertile fancy of native geographers to garlands of flowers festooning those Far Eastern seas—really represent the crest of a stupendous mountain chain that rears itself from the profoundest depth of ocean ever yet

* Read at the Royal Geographical Society, November 6, 1905. Map, p. 128.

fathomed. From the bottom of that portion of the adjacent bed of the Pacific ocean, known as the "Tuscarora deep," to the top of Japan's loftiest peak, the far-famed Fujiyama is an altitude of 40,000 feet. There is probably no other region in the world, of an area so comparatively limited as that including Fujiyama and the Tuscarora basin, that can show such an extraordinary difference of level.

The general characteristics of this gigantic mountain ridge unmistakably prove its close kinship to the mainland of Asia. Japan, at length acclaimed the true pioneer of moral and material progress in the Far East, already, though unobserved, itself occupied a geological position symbolical of it, for its long sinuous island chain forms nothing less than the advanced frontier of the Asiatic continent. The ocean bed between Japan and Korea is so shallow that very slight uplifting of it would be needed to afford dry-land communication between the two.

The mountain ranges of Japan, from their general formation, may be divided into two main systems, the northern and the southern, or the Russian and the Chinese.

The Chinese or southern system is connected with South-East China, and runs north-east by way of Formosa up into the mainland of Japan. The Russian, or northern, is known to Japanese geographers as the Karafuto system. Karafuto is the Japanese name for Saghalien, "Saghalien" itself representing the aboriginal Ainu name *Saharin*, the "wave-land," in allusion to its mountainous character.

The Karafuto system enters Japan from the north, and runs south-west until it meets the southern system in the middle of Japan, which thus becomes, so to speak, the geological battleground of the two conflicting chains, the Russian and the Chinese. It is here, in the broadest part of the main island, that the deepest and wildest valleys are cleft, and the mountains rise to their loftiest heights, in the picturesque summits known as the Japanese Alps.

The conflict or meeting of these two great systems, Russian and Chinese, naturally results in terrific upheavals, and a vast transverse cleft, or fissure, crosses the island at its widest part, through which a number of great volcanoes have burst their way. This fissure is known as the Fossa Magna. It constitutes the geological boundary between northern and southern Japan, whose features present marked contrasts, for whilst northern Japan is comparatively low and open, the southern division, especially its central regions, includes the wildest and most magnificent scenery in the empire.

The chain of erupted peaks in the Fossa Magna forms the Fuji volcanic range, which is of great interest. It stretches from near Naoetsu, on the Sea of Japan, right across the island, and culminates in Fujiyama, then passing out by way of the Hakone hills and the promontory of Izu into the curious island chain known as the "Seven

Islands of Izu." One of its most familiar peaks is the Ōshima island, so often seen smoking away by travellers approaching Yokohama from the west. In a very interesting tour last summer, my wife and I traversed most of the principal peaks of this range on the mainland, some of them being then ascended for the first time by a European lady.

The great mountain range known as the "Japanese Alps" crosses the main island, as I have said, at its widest part; roughly speaking, from the bay of Toyama on the north, to the bay of Suruga on the south. Some years ago I had the honour of reading a paper before this Society on "Exploration in the Japanese Alps," in which I dealt with some six seasons of travel and mountaineering in the northern half of the range. To-night I am to speak of journeys during eight seasons in the southern half, and in the Fuji volcanic chain eastwards. For the sake of clearness, this portion may be called the mountains of Koshu, from the remarkable province in, or on the borders of which, most of the principal peaks are situated.

The mountains of Koshu form an immense triangular mass mainly enclosed by the river Tenryugawa on the west, and the Fujikawa on the east, the apex of the triangle being formed by the famous Lake Suwa. The geographical title of this mass, suggested by Dr. Naumann, is the Akaishi Sphenoid, from the name of one of its loftiest peaks and the wedge-like shape of the whole. The geological formation is chiefly Palæozoic. It is, roughly speaking, formed of three nearly parallel ranges running north and south, the Akaishi on the west, Shirane in the middle, and the serrated granite peaks of Komagatake on the east. I was told that until I ascended the main summits, to which I shall refer, scarcely any of them had been previously visited by European travellers.

The average height of the loftiest peaks is about 10,000 feet, but the character of the scenery, grand though it is, is hardly so wild and rugged as that of the barer, less richly wooded mountains in the northern half of the Japanese Alps, such as Hodakayama and Yarigatake. The nearest and most accessible town of importance is Kofu, on the east, the capital of the province of Koshu, which is connected by rail with Tokyo, six hours distant, the picturesque route leading us through the longest tunnel in Japan, $3\frac{1}{4}$ miles in length, under the Sasago pass. Kofu (population 40,000) is one of the most progressive towns in Japan, and stands in a broad, fertile, mountain-circled plain, once probably the bed of an ancient lake, now dotted all over with thriving villages. It is the centre of a considerable commerce in silk, grapes, and paper. Some of the silk filatures employ several hundred persons, chiefly young girls, whose hours are said to be fifteen per day, without a break for meals or even a Sunday holiday, and this continues all the year round, with the

HODAKA-YAMA, FROM YARIGATAKE

SHIRANE SAN, WITH KAIGANE (10,334 ft.), HIGHEST POINT, ON RIGHT

(Taken from hill above Shoji Lake at west foot of Fuji San.)

exception of two months in the winter. Until lately the trade with the coast has been carried on by means of pack-horses over the hills, or by hundreds of boats down the river Fujikawa; but these have been practically replaced by the railway which now joins Tokyo with the fertile regions of Central Japan.

On some of the main roads runs a remarkable and very popular vehicle, known as the *bȧsha*, a cross between an ambulance and a hearse, whose behaviour frequently suggests the probability of its employment in the capacity of one or other of those conveyances. Its repeated use in emergencies was one of those fond delusions to which one sometimes so unaccountably clings (and the *basha* needs energetic clinging to), for its speed only averages 3¼ miles an hour, and a day out in it always struck me forcibly as one of the most violent forms of exercise in which a man of robust health and nerve is justified in indulging.

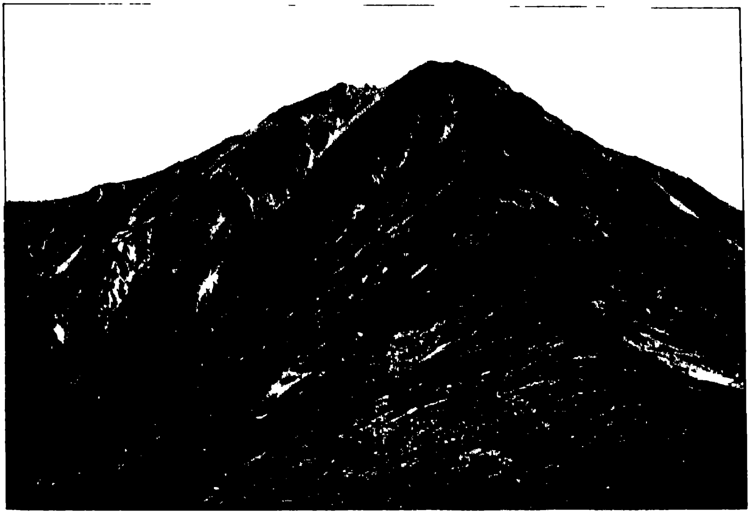
The use of the *basha*, however, can only be enjoyed in the plains and on the more level roads. It must then give way to the pack-horse, from which finally one's baggage is transferred to the backs of sturdy peasants and hunters. These hunters are capable of carrying great loads, which they fix on a wooden frame (similar to those used in the Alps), known as *yasemma*, or "scraggy horse." Some of them were my companions during many expeditions, of which the climb of Kaigane, 10,334 feet, the highest of the Koshu range and the culminating peak of the central mass, may serve as a specimen of mountain travel in this region. Of this fine peak I made the first ascent (by a foreign traveller) three years ago, repeating the climb last summer. A short day's journey westwards across the Kofu plain took me through a curious natural gateway in the foothills up a beautiful valley, where Ashiyasu lies, 2200 feet, a hamlet of dark scattered chalets that cling with difficulty to the steep and broken slopes and ledges that rise high above a wild torrent bed. Picturesque they are, but it was distance that lent them their chief charm, for their most striking actual features can be neither photographed nor described—their squalor and their odours. One soon ceases in these lower inhabited valleys to be surprised at anything one sees, and at nothing that one smells. All, however, was redeemed by the delightful courtesy of the kindly village headman, Natori Unyichi, the whole resources of whose establishment were put at my disposal, a perfect stranger in a house that had never sheltered a foreigner before, nor heard of a foreigner's strange wants and ways. No sooner had I made known my purpose than he hastened to do all in his power to further it. The way to Kaigane was little known, he said, and very rough and fatiguing, if not perilous, but, if I would be content with the company of a trio of bear-hunters, he would get me the best he could find. These duly arrived, and offered most respectful greetings, though somewhat shy on their first introduction to a *gwaikokujin*, "an outside countries man." They proved delightful companions, willing, thoughtful,

and most eager to please. I met them with interest, and at last parted with genuine regret.

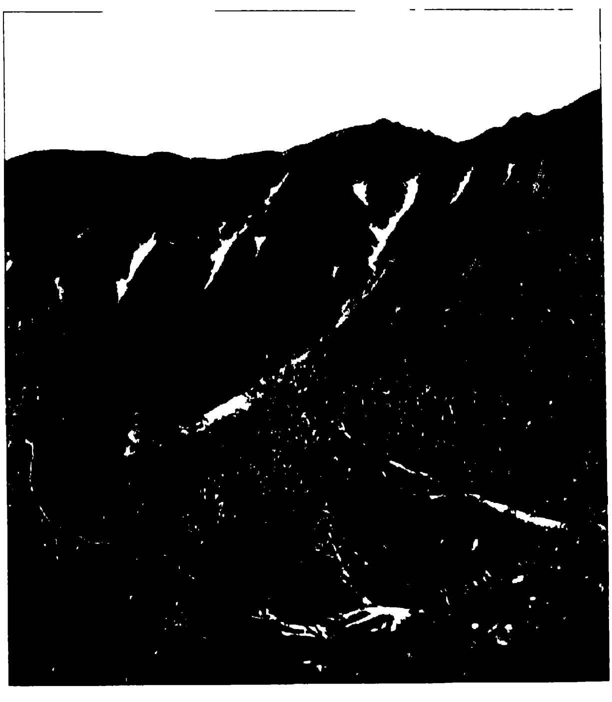
Our first day's journey began with an early start from Ashiyasu, at which the whole strength of the juvenile inhabitants turned out to assist—a motley crowd of jostling, wild-eyed, and incredibly filthy little people.

As we passed the village shrine, my hunters turned aside to offer a prayer for protection and success, exactly as, a dozen years ago, my Swiss guides had done on the way to the Matterhorn.

A fatiguing scramble of five hours in a scorching sun placed us on the top of a ridge, 6500 feet, commanding a fine view towards Fuji, some 30 miles distant, and of part of the upper reaches of the Fuji-kawa, where it leaves the Kofu plain. Close by grew large quantities of a wild raspberry of enormous size, called *kuma-ichigo.* A rough descent of four hours took us down to the bed of the picturesque Norokawa, one of the torrent-feeders of the Fujikawa, and a still harder struggle of four hours more was needed before we could shelter for the night higher up the valley. Sometimes we had to wade from side to side, up to our waists, in the ice-cold stream, or leap from rock to rock at the side. Occasionally we had to spend half an hour in felling and fixing a tree-trunk, 20 or 30 feet in length, to serve as a bridge. Daylight was dead and the ravine wrapped in darkness long before we could gain our bivouac, and the last hour's work was only accomplished by the faint glimmer of an Alpine lantern, where a slip, unroped as we unavoidably were, would have plunged one into the roaring, swirling torrent with little chance of rescue. Our fourteen hours' scramble at last ended at a spot where, at 5500 feet, in the tangled undergrowth and trees on the left bank of the stream, a dilapidated hut of birch-bark betokened a shelter used by hunters and woodcutters, the sole visitors to this lonely valley. From the low smoke-blackened roof on a tough creeper hung an iron cooking-pot, and this, with a chamois-skin, formed the sole furniture of the hut. However, we spent two comfortable nights under its shelter, the intervening day being occupied by my hunters in fishing, for these streams abound in small trout of half a pound upwards in weight, and a dozen or so are soon taken. On the second morning I started at early dawn with my two strongest men, leaving the oldest of the three to guard the hut and our belongings in our absence. Fording the torrent, here 100 yards in width, we crossed to the right bank and began a rough scramble of six hours up a steep buttress towards the summit of Kaigane, which rose finely above a great ravine known as the O-Kamba. Forcing our way up torrent beds and over the interlacing roots of the *kamba*, or giant birches, or of pines on the lower slopes, we suddenly came upon the rotting, shattered timbers of a little shrine, once built by the father of the friendly headman of Ashiyasu for the worship of the spirit of the mountain. Here used to



TOP OF KAIGANE FROM SOUTHERN ARETE



EAST BUTTRESS OF KAIGANE FROM NORTH

come parties of hunters, sent as a deputation in times of drought to supplicate the *genius loci* for rain, on behalf of the peasants below. Now, however, an energetic and practical Meteorological Office, and improved methods of irrigation, are influencing them otherwise, and the sacred building, I was told, would never be restored. Beyond the forest came a broad belt of *haimatsu*, or creeping pine; and above this, to the south, towered the bare grey crest of the triangular summit of the mountain. Alpine flowers of every hue, in great variety, adorned the upper slopes.

Especially noticeable were a magnificent deep blue-and-white columbine (*Aquilegia akitensis*) at a height of 9500 feet, and the bright yellow *Potentilla gelida* on the actual summit. This I also found on the highest point of two of the other loftiest peaks in the range—on Ainotake, 10,260 feet, and on Senjodake, 9741. At intervals appeared quantities of the beautiful *Schizocodon soldanelloides*, a near kinsman of the Alpine soldanella, sometimes white, but more frequently a lovely pale claret colour. In the spring-time one finds it as low down as 3000 feet, but on Kaigane and Senjodake I gathered it as high as 9700 feet; varieties of saxifrage, a beautiful yellow violet, *Viola biflora*, *Geum dryadoides*, and many others abounded.

On the top, which commands an extensive and interesting prospect, I found a tiny wooden shrine enclosed in a little cairn, and in front of it a votive offering in the shape of a wooden sword some 10 inches long. Last year, when I made a second ascent of Kaigane by a slightly different route, I found the cairn destroyed and the shrine in fragments, and its place occupied by a surveyor's pole, on which fluttered the tattered remnants of a red-and-white signal flag. Even in these lonely mountain solitudes the finger of scientific progress is leaving its mark, and on every hand is some sign or other that the "old order changeth, giving place to the new."

The next morning early we descended to our hut, greatly to the relief of our old companion left in charge, and many were the kindly greetings and the attentions showered upon me on my return, after five days' absence, to the hospitable headman's home at Ashiyasu.

Of the fine granite peaks that form the east flank of the mountains of Koshu, the loftiest and most striking is Komagatake, close upon 10,000 feet, along the east base of whose lower foothills the railway from Kofu to Suwa is now being carried.

The summit commands a wonderful view on every side, and embraces all the loftiest peaks in Central Japan—a stretch of nearly 150 miles. It is adorned with the now familiar combination of votive offerings and surveying station side by side, but it would appear that the *genius loci* has still a considerable following, for many of the memorial stones and pilgrims' flags are quite new and substantial. On the occasion of my second ascent to the summit, I traversed the mountain—the first time for a European traveller, I believe—by getting down

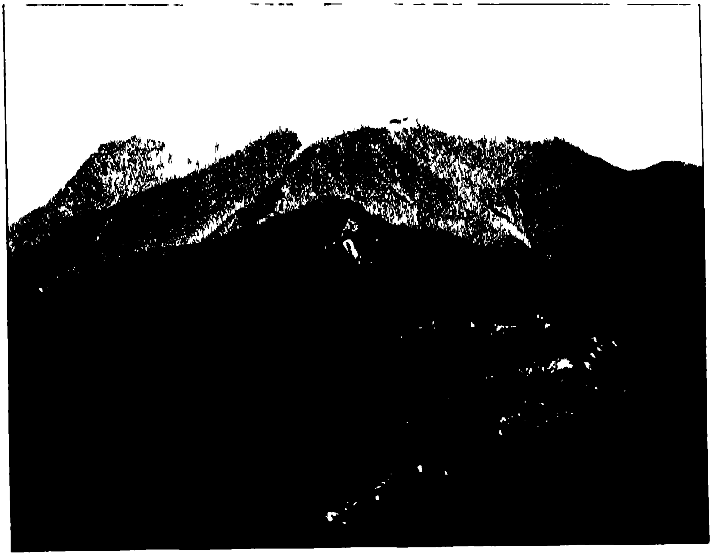
on the west side, and so again reaching the headwaters of the Tenryu-gawa in the neighbouring province of Shinshu. This involved the descent of 5000 feet of very steep and broken granite cliffs, a work of nearly five hours' continuous exertion, and then four hours more were needed before we reached our shelter for the night. At the foot of the last precipice, on which dark pines grew thickly wherever they could find a footing, my hunters turned aside, and led me to a spot, where, on a little shelf of rock, lay the decaying remains of a little shrine. Inside it were a human skull and a few bones, all that was left of a lost chamois-hunter, whose body had been found many years before at the foot of the cliffs we had just descended.

A rich harvest of Alpine flowers awaits the attentions of botanists on this fine mountain also. At a height of 7000 feet most exquisite rhododendrons, of a delicate cream colour, light up the darkness of the silent pines, and occasionally the delicate waxen stem of the "Indian pipe" is seen close by.

The southerly neighbour of Komagatake, Huzan, the "Phœnix" peak, is one of the most striking summits in the granite range. Until last summer it was held to be inaccessible to human foot. Even Dainichi Nyorai, the famous Buddhist saint, is said to have himself returned vanquished, and he had to leave his memorial stone at the foot of the final pinnacle of granite, which rises from a precipitous disintegrating ridge to a height of 9500 feet. To it the comment of a native Japanese geography, speaking of this range, applies with special force: "This is one of the most mountainous regions, and there are in it trackless wilds, for these mountains are almost beyond the ability of human legs to climb."

From the house of my friend the headman of Ashiyasu, a fatiguing climb northwards of eight hours landed us at our bivouac, a ruined woodman's shelter on the south flank of Huzan, high above the valley of the Norokawa, and looking westwards over towards Kaigane. The altitude is 8000 feet, and a crystal spring of icy-cold water rose hard by.

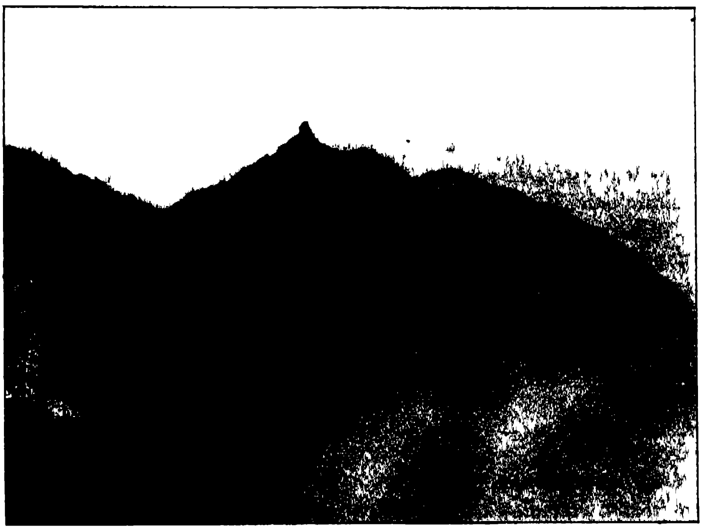
A three hours' climb the next morning led us over the intervening peak of Jizodake, 9700 feet, to a low saddle between it and Hoozan, and close by, at a height of 9000 feet, I found a beautiful dwarf rhododendron, *Schizocodon soldanelloides*, and a lovely orchid (*Cypripedium Yatabeanum*), besides many other Alpine plants amongst the straggling *haimatsu* (creeping-pine) below the ridge. As we passed along the gap, my three hunters were suddenly thrown into a state of wild excitement by the appearance, on a sort of promontory jutting from the gap into a wild ravine on the left, of an *iwa-shika*, or chamois. Without a further thought of the main object of our climb, two of them flew off like monkeys to stalk the animal, having only one rifle between them. They were soon lost to view in the ravine, and my



KOMAGATAKE (KOSHU) FROM NEAR SUMMIT OF KAIGANE

EDGE OF WESTERN LAVA STREAM OF FUJI SAN NEAR THE LAKE OF SHOJI

remaining companion and I were left to finish the ascent as well as we could. The ascent of the final peak I made alone, after several hours of unusually severe exertion, which my companion refused to share. On the descent, shortly after leaving the saddle below Hoozan, we met our truant companions, one of them carrying the carcase of the chamois, which they had successfully stalked in the ravine below. It was a fine buck, about five years old, weighing some 70 lbs. Without ceremony they laid it down, cut it open, and at once invited me to partake of the choicest parts of the internal organs, explaining that this would ensure me a share in the animal's own desirable attributes



HUZAN FROM SOUTH. FIRST ASCENT WAS MADE JULY, 1904

of speed, agility, and strength. As I was just engaged in a hard-earned lunch of my own, the gruesome invitation proved somewhat untimely, but that night in camp we supped royally. For several days after this, the chief topic of conversation amongst my men invariably had reference to this first ascent of Huzan, thrilling accounts of which, duly embroidered, were from time to time detailed by the only spectator of the climb.

They finally approached me with a somewhat startling request. It was no less than that I should, as the first to succeed on the "Phœnix peak," where the great Dainichi Nyorai had failed, build at its foot a shrine in honour of the divinity of the mountain, and myself become its first *kannushi*, or guardian priest. It struck me as

the most novel offer of preferment, and the most singular proposition for church-building I ever received!

With regard to the summits of the Fuji volcanic chain, I must only speak of them in passing. Of these, Kengamine, the "Sword peak," my wife and I were the first foreigners fortunate enough to succeed in ascending. A curious feature of several of these volcanoes is the loftier and newer cone rising from within an older, lower, and more broken one. Some of the old shattered ridges are extremely steep and narrow, and afford excellent scrambling. On Kengamine, one *mauvais pas* is known as the "Ants' causeway," where a thin crest, some 50 yards long and 2 feet wide, falls nearly sheer on either side for 200 feet or more. It is regarded as a great work of merit to pass safely across, and, after some hours of exertion, to gain the summit. Those who succeed, and have patience enough to spend a night there, are promised at sunrise a vision of Amida riding on a cloud of rainbow hues.

Miyokozan, the northernmost peak of the system, is a good specimen of the double-topped volcano, especially as seen from Akakura, a quaint solfatara hamlet near its foot.

Yatsugatake, the "eight-peaked" mountain, 9784 feet, rises a short distance north of the Kofu plain, and offers one of the most fertile fields for research in Japanese Alpine botany. Mrs. Weston and I crossed it last year from east to west, and spent some days at an interesting *yuba*, or hot spring, 6600 feet, on its east flank. Amongst the flowers specially noticeable is a beautiful black lily (*Fritillaria Kamschatensia*). On the west, at 5500 feet, we found black currants growing wild, this being only the second or third occasion on which I have observed them in the main island of Japan.

Of Fuji itself the fascination never fails, while some fresh feature constantly attracts attention. This I found especially the case during some of my journeys on the Koshu side of the mountain. On the north-west flank a mighty lava-stream once swept down until its course was arrested on the flanks of the hills which hem in the southern part of the Kofu plain. The line of division between the two formations is so distinctly marked that one can step off from the wrinkled lava on to the Tertiary sandstone or conglomerate in a single stride A chain of lovely lakes, about 3000 feet above sea-level, is formed in some of the deeper hollows of the line of demarcation, and it is said that the level of their waters maintains a constant variation. At the foot of a low hill called Murayama, between the lake of Shoji and the actual north-western foot of Fujiyama, several interesting natural ice-caves have been formed by the moisture which percolates through the porous lava, and freezes in the form of beautiful stalactites and stalagmites of ice. One of these (3500 feet) I explored in the month of May, descending the bell-shaped vertical entrance, some 30 feet in

depth, by the help of a strong rope and the trunk of a pine tree. Our lighted torches disclosed a weird and beautiful scene; but the passage of the cave, nearly 400 yards in length, was a somewhat trying experience, owing to the mixture of broken blocks of lava and bosses of now melting ice over which we had to pick our way.

There are several similar, though less striking, caves in this region, and I have heard that one of them supplies a considerable amount of ice to the neighbouring villages in hot weather.

On the outside of the crater edge, near the highest point, are several cairns and other receptacles for scientific instruments, with which valuable observations are carried on by the staff of the Imperial Meteorological Department. It is odd to see, side by side with these at early dawn, the white-robed pilgrims take their stand to pay their devotions to the rising sun. It presents one of those contrasts that so often seem in rural Japan to make one doubt whether we are living in the tenth or the twentieth century.

A curious instance of this befell me some years ago, when making one of the earliest recorded ascents of Fujiyama while the mountain still wore the snow-mantle that in the spring-time adorns the upper 6000 feet. With my friends, Messrs. Noel Buxton, M.P., and H. W. L. O'Rorke, I called at Omiya, a village at its western foot, to obtain supplies and coolies for the ascent. These were only procured with the greatest difficulty, for we were assured that, as the goddess of the mountain was only "at home," so to speak, to travellers after its formal opening at the end of July, we should surely meet with disaster if we called nearly three months too soon. Oddly enough, no sooner had we reached our bivouac that night, in a broken-down hut in the forest, than a frightful typhoon burst over the mountain, and we were imprisoned there for several days. Ultimately the weather cleared, and we succeeded, in seven hours, in reaching the summit, though all but one of our coolies deserted us at intervals through fatigue or fear. Inspired by the marvellous beauty of the view, which in the early spring far surpasses that at any other season, we decided to descend by a different route, and therefore crossed the mountain to Gotemba, so that our Omiya friends saw us no more. Some days later the native newspapers came out with thrilling accounts of a frightful disaster on Fujiyama, stating that "a party of foreign travellers (supposed to be British, as they alone take pleasure in such risks) had started to ascend the mountain. As, however, a typhoon shortly afterwards broke over it, and nothing has since been heard of them, they have, without doubt, miserably perished."

May I now briefly refer to some other interesting features of this region, and, first of all, to the two chief rivers in whose embrace the great mass is held.

Of these, the Tenryugawa—"the river of the Heavenly Dragon"—

drains the western portion. It rises in the beautiful Lake Suwa, which was once the crater of a gigantic volcano, and whose waters are frozen so hard in winter that heavily laden horses can cross. The lake is about 2½ miles long and nearly 40 feet in depth, but it is said to be slowly filling up. Its neighbourhood is noted for its hot mineral springs, and also for the finest silk produced in Japan.

The Tenryugawa, 150 miles long, flowing at first silently and gently from the lake's western end, gradually gathers strength during a course of 50 miles until at length it cleaves its way through the very axis of a mountain chain, to the Pacific, which it enters near Hamamatsu, on the Tokaido railway, 150 miles west of Yokohama. The river is navigable for boats for nearly the lower 100 miles, and the journey to the sea is of a most exciting character, shooting innumerable rapids and passing through magnificent gorges, with walls towering from 1000 to 2000 feet overhead. Some of the older bridges are very picturesque, but modern contrasts abound.

The Fujikawa, on the eastern side of the Koshu range, carries off the drainage of the mountains encircling the Kofu plain on every side. This plain is said to be the bed of an ancient lake, of which traces still remain. An old local geography (Kai-Koku-shi) states that a famous Buddhist priest, Gyogi, by birth a Korean, in the era Yoro (about 720 A.D.), dug a canal by which the waters of the lake found an outlet in the Fujikawa.

The flooding of these rivers, caused by the melting of the snows at the beginning of summer, and by the heavy rain-storms at its end, leads to repeated inundations, in which considerable destruction of life and property is frequently involved.

The Fujikawa, 100 miles in length, is also navigable for the lower half, from Kajikazawa to Iwabuchi, on the Pacific coast, and though the scenery is less wild and grand, there are features of considerable beauty. Some of the slender bridges of wire and narrow planks are interesting. The more primitive form of these is known as *mannembashi*, "the bridge of 10,000 years," owing to the sensations inspired by the passage of its quaking, swaying length. On the right bank, a few miles from the sea, are some remarkable upright hexagonal columns of andesite.

Although the waterfalls in this region are not numerous, there are several of great beauty, notably the *Shira-ito-no-taki*, or "White Thread cascade," at the west foot of Fujiyama. The stream rushes over the edge of a semicircular basin in the lava, separating into numerous falls of varying breadth, which are regarded respectively as the mother, father, and children, forming one huge family.

On the east side of the range hot springs abound, notably in the neighbourhood of the Fuji volcanic chain, near Lake Suwa and further south. At one of these, Shimobe, a solfatara near the left bank of the Fujikawa, people will sometimes stay in for a month at a time, taking

CRATER OF FUJI SAN WESTERN SLOPES LEADING INTO CRATER AT THE ONLY ACCESSIBLE POINT

IN THE VALLEY OF THE FUJI-KAWA

the precaution, however, of laying a heavy stone on the knees at bedtime, to guard against turning over while asleep. Both sexes bathe together, and the utmost decorum prevails.

Minerals of various sorts abound, though not usually in great quantities. Gold is found in quartz veins, and also in the river-bed, in the valley of the Hayakawa, a tributary of the Fujikawa. On the fine granite peak of Kimpuzah (8370 feet), which I ascended in the spring of last year, are found opals, copper, and the most magnificent crystals in Japan. One crystal mine employs no less than three hundred persons. Near Toyuka gypsum and alabaster are found, whilst in the Hayakawa valley, again, at Suzuri-jima, a much-prized compact clay slate, used for *suzuri-ishi*, or "ink-stones" (for rubbing Chinese ink), is quarried. Slate for house roofs, though too scarce for general use in Japan, is quarried at Ikawa, a village on the headwaters of the Oigawa.

The Fauna of the region is interesting. A black bear, sometimes as much as 6 feet long, is occasionally killed, and last year two cubs, which. with their dam, had been trapped near Ashiyasu, were offered me for sale, The *iwa-shika*, or Japanese chamois, is quite common. It differs from the Alpine variety in having a bigger head and legs, with shorter horns. A fine mountain deer is hunted in the cold weather, when driven down into the valleys by deep snow and by wolves and other beasts of prey. Its skin in winter is thick and brown, but in summer it is a dappled fawn colour. Boars and wolves are sometimes found, and among the pine forests an ugly red-faced monkey has his home. He is said to be unusually cunning, and to be capable of self-defence by throwing sticks and stones at his pursuers. His fur in winter is exquisitely soft and thick, of a beautiful dark grey, and he chiefly lives on tree-shoots, leaves, and vegetables. Badgers, foxes, and hares which turn white in winter, martens, and tiny beautiful brown squirrels abound, the badgers and foxes especially being greatly feared for their alleged powers of bewitching people. Near Lake Suwa are found wild cats with long tails, quite different from the ordinary tailless or short-tailed varieties elsewhere.

With regard to birds, there is a singular deficiency, though sometimes a splendid golden eagle is seen, and hawks are numerous low down. Occasionally the gorgeous copper pheasant flashes through the pine trees, where also the sweet note of the Japanese nightingale is heard; and absurdly tame ptarmigan, which turn white in winter, are very common among the creeping pine at a height of 8000 or 9000 feet, where they love to feed on the young shoots of the crowberry. It is known as *rai-cho*, or "thunder bird," and is regarded as sacred to the god of thunder. Pictures of it are often hung up as charms of defence against lightning.

The Flora of the region deserves both careful and expert attention, but at present it has received comparatively little.

The commonest forest trees are oaks of several kinds, beeches, birch (of which on Kaigane there is a forest of magnificent size), maples, willows, and various conifers, noticeably *hi-no-ki* (*Chamæcyparis obtusa*), much valued for its useful timber. Higher up grow larches, and beyond them the *haimatsu*, or creeping pine.

A list of some of the Alpine flowers of which I preserved specimens may not be without interest. They were identified for me by Dr. Matsumura, the Professor of Botany in the Imperial University of Tokyo (see Appendix).

There is a remarkable difference in the climatic conditions prevailing in the northern and southern parts of the Japanese Alps respectively. In the former, near the Sea of Japan, the temperature is hotter in summer and colder in winter than in the latter, towards the Pacific.

In the case of the mountains in the northern half, the cold dry north-westerly winds of winter, sweeping across from Siberia, gather up the moisture over the Sea of Japan, and deposit it in a heavy snowfall that often nearly buries whole villages. Houses are then occasionally identified by sign-posts, such as "The Post-office is below," or "The Police Station will be found beneath."

When we come further south, however, except on the higher peaks, there is a marked contrast, especially near the Pacific coast. In place of the snowstorms of the north-west, with their leaden skies and biting winds, the winter weather is there usually bright and sunny, and the snowfall is comparatively slight.

The simple unaffected politeness, and the kindly hospitality one receives almost everywhere, leave the most delightful memories behind. Not only the village headmen, of whom I have spoken, but even the local country police whom one meets on the outskirts of the ranges, are always ready to further one's plans to the best of their powers. One to whom I once applied for information actually volunteered to climb my mountain with me, and proved a most excellent companion. He was very diminutive, but extremely dignified, and imperturbable under all circumstances. Even when, one night in camp, I unluckily rolled out of my hammock and landed somewhat heavily on him as he lay snoring peacefully below, his sole comment was a word of polite apology, "O jama wo itashimashita," *i.e.* "I am so sorry to have been in your honourable way."

As a rule, the peasant folk are very honest, a feature in which they distinctly excel the ordinary commercial classes in many of the larger, more "civilized" towns. The only robbery I ever suffered was in a strange out-of-the-world hamlet named Narada, in the upper valley of the Hayakawa. The place had only twice before been visited by Europeans, my own expedition two years ago with my friend, Mr. John Kennaway, being the first for eight years. Narada is a wild and

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31. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 18 inches	0 2	
32.†Index to the sheets of the 6-inch scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0	
Scotland. Size 24 × 18 inches	1 6	
33.†Index to the sheets of the 1 : 2500 scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0	
Scotland. Size 24 × 18 inches	1 6	

Nos. 32 and 33 are identical with Nos. 11 and 15, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

* Publication in progress. † Publication stopped.

ORDNANCE SURVEY MAPS.

THE following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. Publications may also be ordered through any bookseller, and in towns where there are no agencies they may be ordered at the head post office.

	Price per sheet. On paper. s.	d.	Mtd. on linen. s.	d.
$\frac{1}{1000000}$ or 15·782 miles to 1-inch Scale.				
1. United Kingdom. In two sheets. Size $34\frac{1}{2} \times 24\frac{1}{2}$ inches. Price 5*s.* Mounted as a wall map, 10*s.* Ditto, with moulding and roller, £1.				
10 miles to 1-inch Scale.				
2. Great Britain, engraved. Printed from a transfer from copper, latitude and longitude not marked.				
(*a*) Outline edition in 12 sheets, water in blue. Size about 20×13 inches. On paper	1	0		
(*b*) Hill shaded edition in 8 sheets, with hills in brown, roads sienna and water blue. (Sheets (1 and 2) (3 and 4) (5 and 6) (7 and 8) of this edition are combined.) On paper	1	0		
Sheets specially printed for mounting as one map, together with a title sheet and marginal lines. Price 9*s.* per set.				
The above sheets, mounted on holland, to form one map, and bound with blue ribbon. Price complete, £1 1*s.*; or with moulding and roller, £1 10*s.*				
4 miles to 1-inch Scale.				
3. England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size $22\frac{1}{2} \times 15$ inches. On paper	1	6		
4. England and Wales, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size $22\frac{1}{2} \times 15$ inches.				
(*a*) On paper	1	6		
(*b*) On thin paper, folded in cover or unfolded	1	6	2	0
5. Scotland, engraved. Printed from a transfer from copper, with water in blue, latitude and longitude marked, no hill shading or contours. Size 18×12 inches. On paper	1	0		
6. Scotland, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 18×12 inches.				
(*a*) On paper	1	0		
(*b*) On thin paper, folded in cover or unfolded	1	0	1	6
7. Ireland, engraved. Printed from a transfer from copper, with water in blue. Size 18×12 inches. On paper	1	0		
8. Ireland, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 18×12 inches				
(*a*) On paper	1	0		
(*b*)*On thin paper, folded in cover or unfolded	1	0	1	6
9. County and District Maps of Great Britain, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. In sheets. Unmounted . . . 6*d.* and	1	0		
Folded in covers . . . 9*d.* and	1	0		
2 miles to 1-inch Scale.				
10.*England and Wales, photo-etched on copper. Printed from a transfer from copper, hills and contours in brown, principal roads burnt sienna, woods green, water blue, latitude and longitude marked. Size 18×12 inches				
(*a*) Folded in cover or unfolded	1	0	1	6
(*b*) Combined sheets (various sizes) folded in cover or unfolded	1	6	2	0
1-inch Scale.				
11. England and Wales, outline, contours in black, latitude and longitude marked. Size 18×12 inches. On paper	1	0		
12. Ditto, hills hachured in brown, latitude and longitude marked. Size 18×12 inches. On paper	1	0		
13. Ditto, hills hachured in black, latitude and longitude marked. Size 18×12 inches. On paper	1	0		

* Publication in progress.

primitive spot, whose inhabitants all bear the same name, Fukasawa, and usually only intermarry among themselves. They looked poorly nurtured, and were dirty and unkempt beyond description, and I noticed that the almost invariable topic of conversation, in the strange and uncouth dialect they spoke with my hunters, was the price of rice, of which they, however, seemed to get very little. My belongings they eyed with intense curiosity, my camera and a pocket-book attracting special attention. The camera was pronounced by the most travelled inhabitant to be a telescope, but the pocket-book they are probably still investigating, for I was relieved of it and its contents during my short halt amongst them, and never saw it again.

Narada boasts of "seven wonders," said to have been bestowed by a princess named Nara-O, who "once upon a time" paid a literally "flying" visit to the Hayakawa valley. These wonders are as follows:—

1. A reed, called *kataha no ashi*, whose leaves grow only on one side of the stem.

2. A pair of crows, whose numbers practically never increase.

3. "*Sentaku-ike*"—a tiny pool whose waters never need the addition of soap for washing purposes.

4. "*Binroji-ike*"—a pond, in the mud of which articles of clothing, if left for a time, are dyed an inky black.

5. "*Shiwo-ike*"—a perennial pool of salt water.

6. "*Go-o-sui*"—"The August Princess's water," a spring especially efficacious in disorders of the stomach.

7. The last and crowning "wonder" of Narada is, that the princess ever went there at all!

My last two expeditions were made during the progress of the late war, and afforded frequent opportunities of observing how the everyday habits and the ordinary institutions of even the commonest peasants all play their part in fitting the Japanese soldier for fighting the battles of his country as few soldiers ever fought. The frugal food and shelter with which he is familiar at home help to prepare him for the hardships and privations of Manchurian campaigns, whilst the climatic conditions, varying as they do from semi-tropical to almost sub-arctic, serve to inure him to all kinds of extremes elsewhere, and he readily adapts himself to his surroundings. The open and communistic character of his daily life—indeed, privacy is almost unknown—tends to render him natural and to develop self-restraint, patience, and resourcefulness. On our expeditions my hunters were never idle, and even on off-days in camp they rarely rested. Nearly all their spare time was spent in fishing, making toys, and playing games, or occasionally writing notes of the journey or what not. They invariably showed great interest in my country, and, for men of little education, asked quite intelligent questions about it. Most of the headmen possess rough maps of their

district, and my companions readily understood the use of those I carried when explained to them. The headman, a sort of village mayor, is a useful factor in the organization of the country-side. Two years ago, when engaged in the work of distributing the relief sent by the foreign residents in Japan and China to alleviate the distress during the Aomori famine in northern Japan, I was brought into close contact with many of them. During the preliminary work of investigation, I found it possible almost at a moment's notice to obtain, through the headman of any given village, the minutest information of the circumstances of any given family. The social organization, so to speak, is most extraordinary all over the country, and the average Japanese possesses the most remarkable aptitude for the mastery of details. On every hand one is reminded that Western civilization has come to a people already possessing, to a high degree, those very capacities and faculties of assimilation that most enable them to adapt for their own purposes whatever they have adopted from the resources of Western peoples.

To what extent they will succeed, however, as *permanent* colonists on the mainland of Asia need not now be discussed. What is certain is that the new fields acquired by Japan on the mainland seem very favourable for the experiment. No less than seven-eighths of the area of Japan is mountain land, and of such a character as to practically preclude the permanent support of a rapidly increasing population. Korea, however, with its hills and forests, its mineral wealth and its fertile plains, has been, as yet, comparatively little exploited, and offers exactly the colonizing ground needed for the overflow of the swelling tide of Japanese life.

APPENDIX.

PLANTS FOUND BY THE REV. W. WESTON IN THE SOUTHERN JAPANESE ALPS.

On Kaiganf.

Alsine Arctica (Fengl.).
Anaphalis Alpicola (Makino).
Anemone narcissiflora (L.).
Aquilegia Akitensis (Huth).
Diapensia Lapponica (L., var. *Asiatica*, Herd).
Draba Nipponica (Maxim).
Dryas octopetala (L.).
Geum dryadoides (Sieb. et Zucch.).
Lychnis stellarioides (Maxim).
Oxytropis Japonica (Maxim).
Pedicularis chamissonis (Stev., var. *Japonica*, Maxim).
Phyllodoce Pallasiana (Pall.).
Potentilla gelida (C. A. May).
Saxifraga bronchialis (L.).
S. cernua (L.).
Schizocodon soldanelloides (Sieb. et Zucch.).
Sedum rhodiola (DC., var. Tashoioi Fr. et Sav.).
Stellaria florida (Fisch, var. *angustifolia*, Maxim).

ON SENJOGADAKE.

Aquilegia Buergeriana (Sieb. et Zucch.).
Arabis amplexicaulis (Edgew.).
Astragalus frigidus (Bunge).
Campanula dasyantha (M. A. Bieb).
Clematis Alpina (Mill).
Cypripedium Macranthon (Swartz).
C. Yatabeanum (Makino).
Draba Nipponica (Makino).
Eritrychium pedunculare (A. DC.).
Euphrasia officinalis (L.).
Geranium eriostemon (Fisch).
G. Hakusanense (Matsumura).
Geum dryadoides (Sieb. et Zucch.).
Hypericum Senanense (Maxim).
Leontopodium Japonicum (Miq.).
Pedicularis Keiskei (Fr. et Sav.).
Polygonum viviparum (L.).
Ranunculus acris (L., var. *Stevnie*, Regel).
Rhododendron chrysanthum (Pall).
Saxifraga bronchialis (L.).
Schizocodon soldanelloides (Sieb. et Zucch.).
Sedum Senanense (Makino).
Thalictrum aquilegifolium (L.).
Thymus serpyllum (L., var. *vulgaris*, Benth).
Trautvetteria malmata (Fisch, var. *Japonica*, Huth).
Trientalis Europœa (L.).
Trollius patulus (Salisb. var.).
Vaccinium vitis-idœa (L.).
Viola biflora (L.).

ON KOMAGATAKE.*

6000–7000 feet.

Arabis lyrata, L.
Astilbe Thunbergii, Miq.
Cassiope lycopodioides, Don.
Cornus Canadensis, L.
Deschampsea plexuosa, Trin.
Geum Calthæfolium, Menz. (var. *dilatatum*, Torr. et Gr.).
Pedicularis Chamissonis, Stev.
Phyllodoce taxifolia, Salisb.
Pirus aucuparia, Gaertn. (var. *Japonica*, Maxim).
Polypodium Senanense, Maxim.
Rhododendron rhombeium, Miq.
Saxifraga cortusæfolia, S. et Z.
Schizocodon ilicifolius, Maxim.
Solidago Virga aurea, L.
Trientalis Europæa, L.
Tripetaleia bractata, Maxim.

8500–9500 feet.

Andromeda nana, Maxim.
Arctous Alpina, Niedz.
Arnica Alpina, Olin. (var. *A. angustifolia*, Vahl).
Diapensia lapponica, L.
Empetrum nigrum, L.

9500–10,000 feet.

Angelica multisecta, Maxim.
Carex montana, L. (var. *Oxyandra*, Fr. et Sav.).
Cerastum schizopetalum, Maxim.
Luzula campestris, DC. (var. *Multiflora Celanos*).
Pilea petiolaris, Bl.
P. pumila, A. Gr.
Pirus aucuparia, Gaertn. (var. *Japonica*, Maxim).
Potentilla gelida, L.
Saussurea Tanakæ, Fr. et Sav. (var. *phyllolepis*, Maxim).
Schizocodon Soldanelloides, L.
Sedum Rhodiola, DC. (var. *Tashiroi*, Fr. et Sav.).
Stellaria florida, Fisch (var. *angustifolia*, Maxim).
Viola biflora, L.
Vaccinium vitis-idæa, L.

Before the paper, the PRESIDENT said: There is no occasion for me to introduce to you the Rev. Walter Weston. Many of us remember how, eight years ago, we

* Some of these were supplied by my friend Mr. Takeda Hisayoshi.

heard him deliver an address on his travels in an out-of-the-way part of Japan. His address to-night will deal with another portion of the same country that he dealt with before, and I think, from the pleasure we had in hearing him in the past, we are assured of having great pleasure in hearing him to-night. I will now call upon him to deliver his address.

After the paper, Rev. H. W. L. O'Rorke: There is one part of the delightful tour which Mr. Noel Buxton and I took with Mr. Weston, of which I would speak, and that is of the descent of the Tenryugawa rapids. We approached over one of the most beautiful passes in the whole world, until we reached the Tenryugawa rapid at about two o'clock in the morning. We always worked for eighteen hours a day, and that is why I cannot tell you much: I had not time to write down anything. We started at six o'clock in the morning, and we had four hours' sleep. Those rocky gorges which have been described to us, but of which, unfortunately, we have seen no picture, convey to my mind the most beautiful of all river scenery that is to be seen in the world. I have been down the Rhine and the Danube, but the Tenryugawa is far finer than either. From the rocks above hang down wisteria, in all their glory of mauve and white, and the air is scented with their delicious perfume. The journey is one of considerable risk, though the boatmen are so careful in taking you down the rapids, and so thoroughly understand their business, that you do not realize your risk. The risk is owing to the trees which are being cut on the upper side of the gorge, and which are allowed to fall down into the river and float thence down to the sea. I think that of all countries in the world you can understand most of the character of the people from the geography of Japan. You have heard that seven-eighths of the country is mountainous. I did not know the proportion was so large; I thought seven-tenths; but if seven-eighths is mountainous, you can understand the hardihood and independence of the average Japanese. We have only to realize that with seven-eighths of mountainous country and one-eighth of plain, they support a population of forty millions. That means that every man must do an honest day's work, that every man must lead the simple life, and we cannot doubt what the fate of such a people as that will be in the history of the nations of the world.

Mr. J. H. Longford: I have very little right indeed to speak upon Mr. Weston's interesting paper, because I have scarcely any direct knowledge of the places which he so admirably described to you, with the exception of the district immediately surrounding the two picturesque rivers he has mentioned. But in an amateur way I have sufficient experience of mountain travelling in Japan to be able to form an estimate of the difficulties which Mr. Weston must have overcome in doing all he has done so successfully, and of the pluck, endurance, and determination which he must have shown to have reached the summits of those hitherto inaccessible mountains. A good many of you, no doubt, have experience of the Alps, and you perhaps consider you have had sufficient discomfort in your mountaineering experiences when you have had to sleep on straw in draughty chalets, and your slumbers were broken, when they seemed to have hardly begun, by the loud tinkling of the cattle-bells. But I can assure you that the worst physical discomforts of the lower Alps are as nothing compared with what one must undergo when mountaineering in Japan. You arrive at night weary, wet, and worn, and you have to crowd with coolies, hunters, and guides into a small hut without a window, and in the middle of which there will be a fire of green wood alight, with no opening for the smoke to escape. Your best food will be cold rice and bovril. And then, when you have overcome all, and you think you are going to be rewarded for your day's fatigue by sleep, you will be terribly disappointed. The Japanese are the most inveterate gossips in the world, and no fatigue seems to prevent them from

indulging in it. While you are trying to sleep they will keep up most incessant chatter till about twelve o'clock, and then quiet comes, but about two o'clock they wake up and begin again. One mountain that Mr. Weston has spoken of, Huzan the Phœnix peak, which he very justly said has never been trodden by human foot before, I have no personal knowledge of, but I happen to be in possession of an old illustrated native topographical work, which gives various pictures of it, and I assure you that Mr. Weston's illustrations, compared with those pictures, were modest in the extreme. The peak is shorter than that of the Matterhorn, but it is just as steep, and when you remember that the first ascent of the Matterhorn was made by a large party of experienced alpine climbers, several of whom unfortunately sacrificed their lives in their exploit, you can form an idea of Mr. Weston's pluck and mountaineering skill in venturing on and successfully accomplishing this difficult feat entirely alone and unaided. He made one slight slip in his paper. In speaking of Huzan, he mentioned Dainichi Nyorai, the Buddhist saint, as having attempted but failed in the ascent, but in doing so he made a slip. Dainichi Nyorai was one of the Buddhist Trinity, the personal perfection of wisdom and purity, but he was never in Japan at all. The Buddhist to whom Mr. Weston meant to refer was Kōbō Daïshï, who was one of the most celebrated persons in Japanese history. He not only was a patron of sculpture, an author, the founder of one of the greatest monasteries in Japan, and the inventor of the Hirakana, the syllabary, which the Japanese use to this day, but he was reported to have ascended every mountain-peak in Japan, with the exception of Huzan. I might say, whilst referring to the monastery which he erected, Koya San, it is one hardly ever visited by European travellers, as it lies a little out of the way; but it is one of the most wonderful sights in the world, and is situated in one of the most magnificent spots in Japan. If it should be the good fortune of any of you to visit Japan, I cannot too strongly recommend you not to omit it. Then Mr. Weston also referred to the Buddhist Korean priest Giogi Bosatsu, of whom it is reported that he constructed the canal which leads out of Lake Suwa and ends in the river Fujikawa. He is only one of the Buddhist Koreans who came over to Japan in the sixth century of our era and brought with him the Buddhist literature, and he was one of the first to expound its mysteries to the Japanese. He not only did that, but he taught them the art of making pottery, and there is still one well-known ware in Japan which bears his name, and is in everyday common use. Mr. Weston has spoken of Japan's mission in Korea. Well, it may be Japan's mission to introduce Western civilization; but if she does, she will only be repaying the debt which she incurred herself to Korea more than a thousand years ago, when she obtained from it all the elements of Chinese civilization, on which she lived until she was brought into contact with foreigners. She has not hitherto paid the debt; but we will all hope that a new era has dawned, and that a prospect is now opening of that wretched country, under the honest and enlightened administration which Japan will secure for it, becoming as prosperous even as Japan itself.

Dr. Vaughan Cornish, referring to Mr. Weston's journey to the extreme north of Japan, on which he obtained an exceedingly interesting photograph of the village buried in snow, gave some account of Mr. Weston's persistent and praiseworthy efforts on his return to obtain relief for the famine-stricken people in that region, efforts which were crowned with success, Mr. Weston himself, under the greatest difficulties, conveying the relief and distributing it to the grateful people.

The President: I will simply propose a hearty vote of thanks to Mr. Weston for his admirable paper. There is no occasion to say anything about it, because the way in which you received it is quite sufficient proof of its merits.

A JOURNEY TO THE LORIAN SWAMP, BRITISH EAST AFRICA.*

By Lieut.-Colonel W. H. BROUN.

It is necessary to obtain the sanction of the Commissioner of the Protectorate to pass the equator to the north and to travel to the east of Mount Kenia, for in this direction the natives are little known, and they are believed to be hostile. I was referred by the commissioner to the sub-commissioner of the Fort Hall district, on the understanding that if no objection was raised, the route to the east of Mount Kenia could be taken.

The caravan, or safari, as it is called in East Africa, consisted of thirty odd porters and a Swahili guide who had been to the Lorian swamp before. The porters were Swahili and Wanyamwezi: these men are the most suitable for long journeys. They carry more weight, 60 to 70 lbs., are more dependable than the other races, and they like the life. To carry the food of the porters there were eight donkeys. They feed themselves, and were indispensable in a country where food is renewable only at wide intervals. The load for a donkey is 120 lbs.

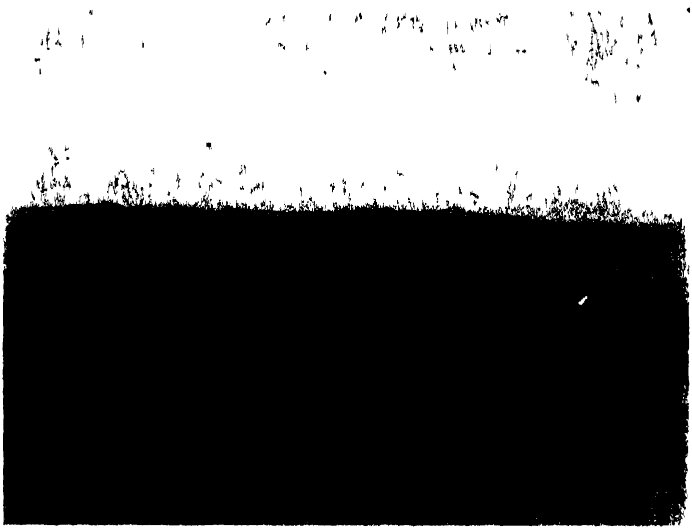
Fort Hall was left on June 12, 1904, and the first part of the journey was to the junction of the Thika and Tana rivers, some 32 miles below and south-east of Fort Hall, the path leading down the spurs from the Kikuyu hills, on the summit of one of which the Government station is located. On this section three streams are crossed which flow into the Tana to the east, and through one of them the animals were swum by a rope fastened to the neck, paid out on one bank and hauled in on the other side of the stream.

The next section of the journey, 140 miles, is from a point on the right bank of the Tana, 6 miles up-stream to the east, to the rapids of the Tana, north of Mabea, a Wakamba village. It was the most unpleasant portion of the journey, from scarcity of water. The first march leaves the Tana for the Kangondi hills, south-east across undulating and rising grass plains with many dry watercourses. Camp was close to a water-hole containing evil smelling mud, which was cleaned out, and it was late in the day before water could be obtained. A hill on the Kangondi hills, 1½ mile off, bore 132°. The next march was over picturesque yellow grass expanses with acacias, and many ravines in the rough lava-flow on the surface. The road to Kitui branches off southwards an hour from camp, which was on the side of a north-and-south ravine with pools of clear water. Game was seen from the path—eland (*Oryx beisa*), hartebeeste, and zebra. A troop of two lions and three lionesses (my man said five) were hunting the same herd of game that I was, but they were wary and would not

* Map, p. 128.

allow an approach. The game was very shy, which I attributed to natives, and not to the lions. It is a remarkable fact, in my experience, that lions do not appear to scare game and make it difficult to stalk; hartebeeste and zebra will permit a gorged lion to pass close to them, quietly moving out of his way. I have seen zebra solemnly gazing at a lion 30 yards away eating one of their number.

The next two marches led out of these plains and among some hills to the east, to a village, Mewani, on one of the numerous spurs running north towards Mumoni. Mewani, 3959 feet (B.P.T.), on the head of a spur, is one of numerous Wakamba villages. There is a pleasing outlook over hills and abrupt valleys, the rocks are volcanic and gneiss,



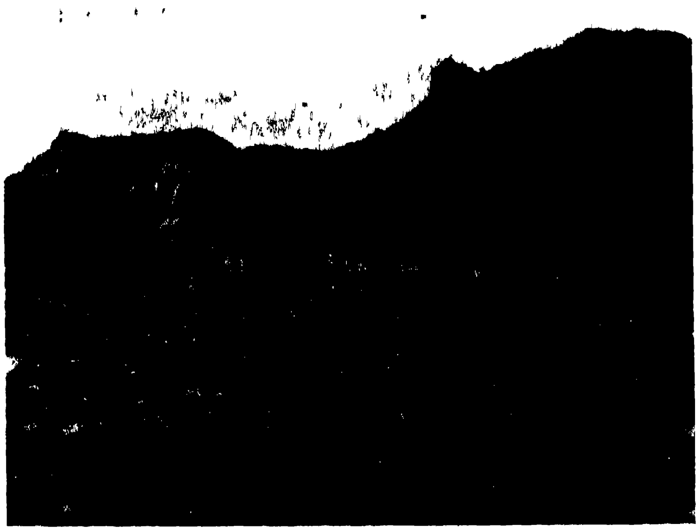
EMBE OR JOMBENI MOUNTAINS FROM ROUTE, GOING NORTH AND PARALLEL TO THEM TO REACH GUASO NYIRO RIVER.

and the vegetation is fresh and green. The water-supply is precarious, and the people obtain it by digging in the ravines; for, like so much of Africa, the rain-water speedily runs off and evaporates. There is one noteworthy phenomenon observed here and on the Jombeni range, which accounts for the fertility of this place and others of like elevation, about 4000 feet, viz. the drenching dews, wet mists, and clouds which are condensed during the cool nights and suffice to keep the crops fresh and growing during the heat of the day. Tibui, the next camp, 7 miles to the north, is under the influence of the dews; but the next camp, 11 miles further north, is by aneroid 3100 feet, and here there is a desiccated thorn bush, no leaf-bearing trees, no villages, and the wet mists do not come down so low.

At Mumoni, camp was made up a hillside (3500 feet aneroid), to obtain water issuing from a spring. The two hills of Mumoni, the summits covered with green trees and bush, are a landmark seen from considerable distances, and about them are a number of Wakamba villages under the fertilizing water-vapours. Food was procurable in trifling quantities only, either from scarcity or indifference of the natives to sell. The Wakamba are a very numerous tribe and their country extensive. They are the most intelligent and industrious race in the protectorate. Their household utensils and personal ornaments have a finish and design superior to other tribes; their arms are bows and short swords. The next march was over the sand-bed of a dry watercourse, with villages bordering the way and hills on either hand to Okazi. Water was only obtainable by digging. The next march was to Millea, due east across a succession of steep volcanic ridges and ravines. A broken, arid, and wild track, the vegetation thorn scrub, cactus, and baobab trees. It was difficult for donkeys, and in several places they required assistance up and down steep and broken inclines. Prospectors of the East Africa Syndicate have been through this district, but no minerals were found. From Millea our camp was changed to Kimmangu, a village close by, to purchase food. The district is a dry one and probably subject to drought, the height 2500 feet aneroid.

From Kimmangu, a night march was made to Mabea due north. This march was made at night, because its length could not be ascertained definitely; the guide was unwilling to move. But the moon was full, and if the march proved a long one, it would be less trying for the men, and donkeys walk faster at night. At 7 p.m., with a rising moon, the march commenced, and at 11 p.m. the next camp, Mabea, was reached. Many Wakamba villages were passed, and from two of them men came out willingly to show the way. The path was open and free from difficulties, and the caravan moved quickly. There are many Wakamba villages round Mabea, which is 2750 feet (aneroid). It is a dry district, and the water is bad and obtained by digging. The physique of the people is inferior to that of the Wakamba previously met, and I saw a large number of men and women and children with indolent ulcers on the legs and person. But the better class among them, who drink milk I was told, were of superior physique and free from cutaneous affections. One old man appeared to have malignant disease of a knee-joint. These people seldom saw a white man. Before the camp was astir in the morning, many baskets of beans and flour were brought for the porters, and eggs and a fowl for myself. This portion of the country is entirely dependent on ample seasonal rains, sparcity and famine must ever menace the people, and their appearance denotes experience of privation. The attitude of these villagers was most confiding and friendly, and men, women, and

children came for medicine for their ailments, and were attended to. These are the last villages south of the Tana river, though patches of bush between here and the Tana are cleared and burnt, and prepared for cultivation in the rains. The next march was a long one without water, though exact information could not be extracted from any one. We marched at 2.30 p.m. the same day, and moving throughout the night, with a halt of three hours, the Tana river was reached at 6.30 the next morning; the donkeys coming in 45 minutes after; the porters, not till 9 a.m. The route was through a very dry, low hill country of dense thorn jungle. The loads on the donkeys were



TO EAST OF EMBE OR JOMBENI MOUNTAINS, SHOWING ROUGH VESICULAR LAVA SURFACE.

frequently overturned, and the bags torn, with loss of food; and the men had to stoop to avoid the thorns, which encroached on and nearly blocked the path in many places. It was a trying march for man and beast. Water was sent back from the river to stragglers. At 1 p.m. a move was made to cross the river. The main stream of these rapids, at this the dry season, is confined in a narrow, deep rock channel under the left bank, where it is too deep and strong to cross. Over the channel an ingenious interlacement of branches of trees has been placed by the Wakamba, who are traders and hunters in the countries to the north. The loads were handed across the bridge of boughs by men on either side and one in the centre. They were

then carried across two subsidiary streams by the men; these streams were not more than 2½ feet deep and some 25 yards broad. When everything had been placed on the farther bank, a favourable spot was located for swimming the donkeys. There was a formidable rush of water 35 yards broad, but the rope held, and they were speedily dealt with. Pushed in, they instantly disappeared under the swirl and eddy; but twenty men standing high above the water hauled quickly, and two men received each animal as it arrived and cast it loose. It was like having a big fish on. Had the rope broken, the animal would have been killed in the rapids below. It was a favoured opportunity for crossing a river which, after heavy rain, would have caused a delay till the water subsided, a delay of days probably. All pretence of official influence ceases south of the Tana. Camp was on the high left bank of the Tana (1300 feet aneroid).

The next section of the journey was from the Tana to Laiju or Zaichu, a village in the Jombeni range of mountains; or, as my guide called them, the Wa-embe mountains, after the name of the principal tribe living in them—distance 35 miles. Leaving the Tana July 2, a march of 5 miles was made on a path through thorn bush and trees to the Zangaza river, a clear stream 20 yards wide, 6 inches deep, which was crossed, and camp formed a few yards from the left bank, on an open space of grass surrounded by dum palms, mimosa, and green-leaf trees—a luxurious grove of shade after the dry, stark, thorn bush country passed through (altitude 1800 feet aneroid). The interpreter informed me that he had heard a lion "shouting" on the march. We halted to rest and feed the donkeys. This river was found to join the Tana 3½ miles to the east of camp. After crossing the Tana it is expedient to march in order, men and animals closed up, for a straggling party would be a temptation to the Wa-embe tribe who frequent the bush. They are reputed to be hostile to Europeans. The next camp was on the left bank of the Ula river, 10 miles, 2050 feet aneroid. The next on the Kura river, 2500 feet aneroid. Both these are clear mountain streams of cold water. After crossing the Tana, it was noticed that baobab trees, which were numerous and large south of that river, were not observed north of it. Lions down wind on the march smelt the donkeys and came up to investigate without showing themselves, though they were noisy. It is said that lions are silent until they have killed, but there are exceptions to that rule. From the Tana river the route is through small trees and thorn bush. At this camp there was foliage; it is close to the foothills.

Next morning Laiju was reached, about 7 to 8 miles, up through the foothills to the lower spurs of the Jombeni mountains, 3195 feet (B.P.T.). A good landmark for Laiju is a perfect crater or volcanic cone close by. Care is desirable in approaching this place; there are dense coverts on the track. The first natives suddenly met were

clearing the bush, and they ran at once for their shields and spears, which were stuck in the ground; but they were reassured by our quiet approach, and showed the way. On this march, in the coverts at the foot of the hill I saw a hartebeeste; the species could not be identified; it was the only one seen north of the Tana. A highly picturesque winding path led to Laiju; parts of it were completely embowered in creepers, forming shaded alleys. It was necessary to put in here to purchase food for the caravan. Laiju is within the influence of heavy dews and moisture-laden clouds at night; the soil is rich dark loam, and the coloured varieties of beans purchased were the finest samples

CRATER OF CHIOMBE, NORTHERN EXTREMITY OF JOMBENI RANGE.

seen in East Africa. The metama was particularly good; sweet potatoes, beans, and corn are grown in abundance.

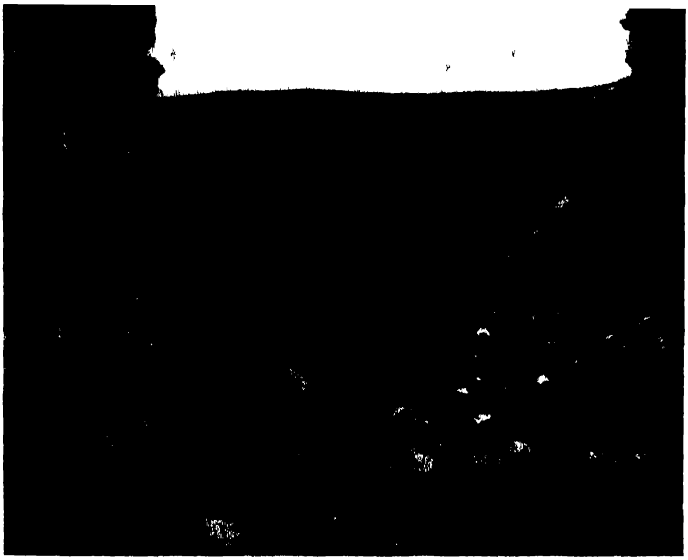
When the extensive areas of mountains and valleys to the east of Mount Kenya are known, with their zones of varying altitude, temperature, and moisture, they will probably be found to be equal to the most fertile portions of the protectorate, and very worthy the attention of planters. The Jombeni range varies from a few hundred feet high to the north, where it ends in sterile slopes and isolated hills, to 7000 feet and probably more above and about Laiju. The existence of Wyzeri, headman of Laiju, and his people appears to be due to the sufferance of the Wa-embe, whose villages are on the encompassing mountains, and who could wipe him out at any time. Wyzeri said he was

glad a white man had come to his country; he had seen one before long ago, an American (Chanler?), who shot elephants. He expressed the hope that the Government would soon send white men to his country. "The Wa-embe were bad people, and killed his men and strangers." Full donkey-loads of beans and flour were purchased for small white beads and chain; an exchange of presents took place, and an amicable parting followed. The morning the caravan left Laiju not a native was seen; none of Wyzeri's people appeared to see us off. The explanation was that Wyzeri feared an attack upon us by the Wa-embe. Had it come off, by confining his men to their villages, all appearance of his being implicated would have been avoided. The next stage of the journey was from Laiju to the Guaso Nyiro river, some 70 miles.

Descending the foothills on July 9, a narrow belt of fine forest trees was passed through, and a route taken well away from, but parallel with, the continuation of the Jombeni mountains north-east, crossing lava ridges falling from the hills, and two clear mountain streams: camp was near the last, 2850 feet aneroid. Cultivation was noted on the slopes of the mountains. A good offing was given to the hills to discourage native enterprise. The next day seven other crystal-clear streams were crossed; one ran through a swamp, and one was seen to end in a swamp 200 yards to the east, and the same volcanic ridges. The guide cautioned me not to allow the donkeys to linger near these captivating streams, for there is a fly in the covert fringing them whose bite is fatal to donkeys; and so it is, as was proved later on. On the following day the route was over broad, flatter ridges, of vesicular volcanic rock, the lava-flow decreasing with the height and size of the mountains; yellow grass up to the knees (good fodder), scattered mimosa trees, raphœa palms, and dense greenery in the depressions containing the streams contributed to soften these wild tracts. Camp was at Mymboro, 2404 feet (B.P.T.), close to a spring and an isolated hill bearing 305°.

Thomson's and Grant's and Waller's gazelles, and water-buck, oryx beisa, eland, zebra, rhinoceros, lion, and I believe a few buffalo; ostriches, frankcolin, crested guinea-fowl, and lesser sand-grouse, are to be found north of the Tana and east of the Jombeni range. The next camp was waterless, and the men were prepared for it. At 1 p.m., July 12, we marched till sunset, and before sunrise next morning for two hours to obtain water, but there was none. After a long fruitless search the guide returned, and the march was continued till 6 p.m., when the donkeys were exhausted and the men spun out for miles behind. The donkeys were unloaded, a guard left, and with the few men who had come up, the donkeys, sheep, a goat and her kid, a thirsty party, we struck across very rough volcanic rocks in the dark to the crater of Mgambe (Chiombe) for water, which was reached at 9 p.m. There is water and slime on the floor of the crater. A water-party was

sent back to the men, which arrived as the last of the porters came up. In the morning one donkey and a sheep were found dead. Chiombo is at the northern extremity of the Jombeni range, and is a typical cup-shaped crater with a fissure in its brim on the east side, through which men and animals had tumbled the night before—altitude 2800 feet aneroid. Along the foot of the Jombeni range there are other craters more or less broken down. Near the water in the crater some bushes grow, and one of the donkeys was struck by a fly and rapidly swelled up along the belly, then the head and neck, and in forty-eight hours it was dead. To reach the Guaso Nyiro, a waterless plain of doubtful



CRATER OF CHIOMBE. THE BREACH ON THE EAST SIDE OF THE RIM OF THE CUP

distance intervened. The guide said two marches. At 1.30 p.m., July 15, with a bearing of 345° on Donio Longelli, the caravan marched and camped before sunset. The route is over lava; in some places each step requires care, in others the rock is disintegrated into dust. There is a short dried grass, which the game eats close to the roots. Early on July 15 the Guaso Nyiro was reached, 2463 feet (B.P.T.). Donio Longelli bore 117° and about 1 mile. The river is some 25 to 30 yards wide and mud-coloured. The guide informed me that Mr. Tate, on his return from the Rendile country, had a camp a few yards away. From the crater of Chiombe to the Guaso Nyiro is not more than 14 miles, but not knowing that, the weak state of the donkeys required caution.

The next section of the journey was from this camp, following the Guaso Nyiro east by its right bank to the termination of the river in the Lorian swamp, 160 miles. In the narrative of Mr. Tate's journey to the Rendile country, *R.G.S. Journal*, February, 1904, the Lorian is said to be six marches east of this camp; my guide said sixteen. It was important to know how many days it was, because there was then only sixteen days' full rations for the porters. If it was sixteen days, it was sixteen days more to return to this camp, and eight days west from this camp to Mzara—*i.e.* forty days before any more food could be bought. It was decided to march four days down the river, and question the guide again. Having done so, he said it was twelve days more to the Lorian swamp. Full rations for twelve days then remained. The porters, when told of the state of affairs, said at once they were very willing to go on. They wanted meat, "only let it be large." Just before reaching this camp, the fourth down stream and some 42 miles, the lava-flow, which from the Tana everywhere forms the surface rock, ceases abruptly at a perpendicular basalt bluff 15 feet high on the side of a ravine, issuing on the river. From this spot, indicated on the map, to the Lorian swamp is about 100 miles. The surface of the country bordering the river is a calcareous loam, which in some places is no doubt alluvial, and the river flows quietly on about 2 miles an hour, very gradually and consistently falling from 1700 feet aneroid at this fourth camp to 908 feet (B.P.T.) close to the Lorian swamp—*i.e.* a fall of 792 feet in 100 miles, or 1 in 666. From the first camp on the river, 2463 feet (B.P.T.), to the fourth camp, 1700 feet aneroid, the fall is 763 feet in 42 miles, or 1 in 290. All the rapids and falls occur in the course of the river above the ravine noted, where it has been affected by the stupendous outpourings of lava which appear on both banks. The route to the Lorian below this ravine is easy, and the river is extremely picturesque, groves of dum palms and flat-topped mimosa affording pleasant shade for camps. The going is sound, the bush in stretches is sometimes dense, and rhinoceros harbour in it, but only once in my absence did one succeed in thick covert in rushing the caravan and overturning the donkeys. The few occasions when rhinoceros took the initiative were promptly dealt with, a Lancaster cordite rifle never failing to kill when it was necessary for the safety of the caravan; its power and accuracy were unrivalled. A most important detail on a journey of this kind is that the men should have confidence their protection is attended to. At the seventh camp down the river, at midnight a lion suddenly sprang into the camp and seized a man by the arm, but he only secured a blanket and made off with it. After crossing the Tana river, six porters were detailed for guard every night, each man for two hours, and the immunity from injury and loss of life is partly, at least, attributable to this precaution. The men demurred at first to the innovation, but later on they undertook the

GUASO NYIRO, EIGHT MARCHES FROM LORIAN, SHOWING A SPECIES OF WILLOW TREE.

GUASO NYIRO. CHARACTERISTIC REACH ON THE RIVER, SHOWING GROVES OF DUM PALMS FRINGING THE BANKS, SOME SEVEN MARCHES FROM THE LORIAN.

duty willingly. At camp 8 down the river an outpost of young warriors of the Samburu tribe was met. They appeared to be doubtful of their reception, but were soon reassured, and accompanied me to the main encampment of these people three marches down the river.

The Samburu at one time belonged to the Masai nation near Naivasha, but as the result of inter-tribal strife their ancestors migrated, and this section of them is located on the right bank of the Guaso Nyiro, up and down which they move to pasture their stock—viz. cattle, sheep, goats, donkeys, and a few camels. They are purely pastoral, and live exclusively on meat and milk. In appearance and bearing and arms and customs they resemble the Masai, and speak that language, modified perhaps by intercourse and intermarriage with the Rendile, who, they said, are their friends, and who wander over the country on the left bank of the Guaso Nyiro and to the north. Their headmen reported that they had recently been raided by the Wakamba from British territory, and were anxious to know if this had taken place with the approval of the British Government, for, they said, "we are the friends of the white man." They expressed fear, also, of being raided by the Masai. They were pacified on both heads, and it is to be hoped, for the credit of our reputation, that another outlet for the energies of the Wakamba may be found. An exchange of presents took place, and they said the Lorian swamp was four marches downstream; and so it was. But as the guide was not sure of the route, and the river has cut a canal-like channel through the alluvial soil nearly three marches from the swamp, and there is little indication of its course a few yards away from it, it was necessary to keep close to the stream, which winds much, and so it was not till the morning of the fifth day, August 2, that camp was pitched on the river some two hours from its disappearance in the reed bed of the swamp, where the river is not more than 10 paces wide and 2 feet deep. The swamp was only half an hour's walk, on a bearing of 145° down a gentle incline; and even then, unless I had been told that a dark line was a reed bed, I should not have known the swamp was certainly there. The altitude of this camp was 908 feet (B.P.T.) and 900 feet aneroid; and allowing 28 feet for the decline, the swamp is 880 feet above the sea. From the first camp close to Donio Longelli it had taken sixteen days to reach the Lorian, and the distance 160 miles. On August 2 and 3 the swamp was examined. Most unfortunately, the small quantity of food left for my porters did not justify a longer stay, and, much to my regret, restrained me from walking round the swamp. What was seen is an immense bed of reeds 12 feet high, and *no open water*. It extended east and south, and a line of low hills bounds it in that direction. My guide said he had walked round the swamp on two occasions, and it was a two days' journey. It is therefore probably 60 miles in circumference, and to the eye that is a conservative estimate.

He was clear that *no water flowed out of the swamp from any point on its circumference.* He was questioned closely on that point. The Guaso Nyiro, on entering the swamp, sends off branches on either side, the larger ones to the south-east; these branches divide and irrigate the surface to a depth of 3 or 4 inches. There are dry areas also, but the footprints of hippopotami and elephants on them were half filled with water, denoting a water-logged state of the surface. The swamp was entered by a hippopotamus track, walking at the side of it and on the bases of the reeds; at each step many mosquitoes were roused. In a large branch of the river there was a party of hippopotami, which

SAMBURU, ELMORAN (WARRIORS). AN OUTPOST ON THE GUASO NYIRO

allowed a photograph to be taken at eight paces. Buffaloes were heard, and there was fresh spcor of elephants, but none were seen. The plain surrounding the swamp had a very desolate appearance to the horizon, a low scrub only dotted here and there. The surface sloped down to the eastward, and in that direction a few zebra and ostriches were seen. Between the camp and the swamp was a large herd of Grant's gazelle and a few water-buck. The scarcity of game in sight was surprising, and it was extremely shy. In the rain season, when the water discharged by the Guaso Nyiro over the swamp must be very largely increased, any extension in the area of the swamp must be to the east, for on the south the range of hills forms a dam in that direction, and the slope of the ground on the west would prevent any

appreciable extension of it that way. The general slope of the country, as I have said, is to the east.

Fourteen miles west of the Lorian swamp, on the right bank of the Guaso Nyiro, there is an extensive shallow depression, with two or three channels meandering across it, covered with coarse yellow grass 3 to 4 feet high, and enclosed by dense tree jungle. When the caravan crossed it, going and returning, the surface was hard and cracked, but it was obviously in the rains under water. The altitude by B.P.T. on the river margin of this depression is 1008 feet, *i.e.* it is 100 feet above the Lorian swamp. This area is also called by the natives Lorian, and in the rains would undoubtedly be a shallow lake nearly 20 miles in length from west to east, and 3 to 4 miles broad. It may be this place, therefore, which has given rise to the report that there is open water at the Lorian.

I saw a herd of about one hundred buffaloes on this depression, and going to the Lorian swamp a white doe water-buck, among a number of common water-buck (*Ellipsiprimnus*). On my return, and at the same place, I saw a white doe, and a white buck with her. They were alone. The buck was shot, the doe unmolested. The buck was a mature animal, perfectly white, with dark muzzle and feet, and eyes of normal colour.

March 6 up-stream was parallel to the Erimba plateau on the left bank, an elevation of some 20 miles in length, its long axis east and west, and its height 300 feet. Camp 12 was a few yards below a remarkable fall 60 to 70 feet high. Below the fall the stream passes through a gorge, the sides rising sheer for about 60 to 70 feet, on the right being white trachyte, on the left a dark basaltic rock. The river (low water) fell over a ledge of basalt, through narrow water-worn channels close to both banks, leaving the polished ledge of basalt in the centre dry; the extension of this polished ledge up-stream forms the bed of the river. This is probably the fall known as Chanler's. The general level of the surrounding surface above and below the fall is preserved, and out of hearing of the falling water there is no indication of its presence, which explains why it was not seen going down the river. On August 16 the first camp was reached, *i.e.* in thirteen marches from the Lorian, and the distance 140 miles (instead of 160 going down), a more direct course being preserved when returning from the Lorian.

The next stage of the journey was to Mzara, seven marches, on the west of the Jombeni range, and north-west of Laiju, 76 miles. This was the nearest food-supply. On August 17 the route was continued for four days up-stream on the right bank, gradually rising, the last 4½ miles of the fourth march being on a bearing of 121° away from the river, and parallel with a small mountain stream coming from Mzara. The altitude at this camp was 3213 feet B.P.T. This stream does not join the Guaso Nyiro, but disappears. In three more marches Mzara

was reached on August 23, the route continuing in proximity to the stream for water. On all sides a great plain extends to the mountains, rising gradually in terraces, the terminations of waves of volcanic flows from the highlands to the south. There are also undulations or broad ridges running from south to north. Dry yellow grass one foot in height and scattered flat-topped mimosa trees form a picturesque prospect. In the early morning the summit of Kenia stands out sharply, a fine sight.

Mzara altitude (mean of three observations, B.P.T.), 4456 feet.
„ (mean of two observations, Watkin's aneroid), 4450 feet.
„ (one observation, aneroid), 4400 feet

GUASO NYIRO TWO HOURS' WALK FROM ITS TERMINATION IN THE LORIAN SWAMP

Ndominuki is the headman of this place, and is on friendly terms with the Wa-ombo tribe, whose country marches with his. He is also friend of Mr. Neumann, an ivory trader in the district. He proved a somewhat inhospitable individual, but a supply of food was purchased for the men. They had been thirty-six days on quarter rations of grain, but fortunately a sufficient quantity of meat had been provided.

The next stage of the journey was from Mzara to Nyeri, with a diversion to the north to the Guaso Nyiro, and another on to the north-west slopes of Mount Kenya, to the lower limit of the forest belt, 7675 feet, B.P.T., some 200 miles. In one long march the plain to the north of Mount Kenya was crossed, direction west, to a stream 4920 feet aneroid, about 3 miles from the steep face of a plateau

400 feet high. Very strong winds from the mountains were experienced daily on these plains, and also on the Guaso Nyiro. On this plain Oryx beisa were very numerous, and hartebeeste were not seen. Should a sextant be used for observations, a protected artificial horizon is essential. The climate on the north of Kenya is exceeding dry, the nights cold, the days hot. It is agreeable in the early morning and after 4 p.m., and resembles the Punjaub in the cold season. On the north-west side of Mount Kenya there are extensive rolling downs of grass at altitudes of from 5000 to 7500 feet. It has the appearance of being an ideal country for great game—extensive coverts, ample water, and abundant grass; but the game is gone, harried and slaughtered by the remorseless Wandorobo hunters.

Nyeri, an official station, was reached on September 18. From thence direct to Naivasha on the Uganda railway is four marches. My caravan proceeded by a more circuitous path, crossing the Kikuyu mountains north-west of Nyeri, the highest camp 10,239 feet (B.P.T.), and afterwards the Aberdare range.

The juniper trees on the Kikuyu mountains are particularly fine; one measured at arm's length from the ground 16 feet in circumference, and others seen were much larger. Various heaths, one very like heather, flourished exceedingly. Everlastings, daisy-like plants, docks, wild strawberry, nettles, brambles, a yellow flower in the grass resembling aconite, and various thick-leaved shrubs with fragrant odours were also noticed. The scenery is magnificent, a maze of heights, forest-clad with bamboos, juniper, and a tree with the outline of an oak, its branches gnarled and contorted, but the leaves resembling an ash, six on each side and one at the apex. These fastnesses were the domain of the elephant in past times, and would be so again if he was protected. But from the numbers of elephant pits passed with the rotting remains of elephants in some of them, it is evident that the Wakikuyu are engaged in the nefarious and illicit pastime of killing this noble beast under the protection of our administration, for previously the dread of the Masai kept the Wakikuyu to their own cultivated areas on the south of the range. These remarks refer to the Kikuyu mountains, and not more than four marches from Naivasha.

This, the final stage of the journey, occupied with halts thirteen days, the distance traversed 91 miles. The last two marches were over the plateau, between the Aberdare mountains and Naivasha. On this plateau there were numerous villages, flocks, and herds of the Masai. Part of these pastures are included in the 500 square miles grant to the East Africa Syndicate, and since passing that way the Masai have been removed to another portion of the country to make way for the new owners.

As a matter of interest, perhaps, for a later date, attention may be directed to the last 100 miles of the Guaso Nyiro river commencing

at the ravine on the right bank where the surface volcanic sheet ends abruptly (from camp 1 close to Donio Longelli, 40 to 41 miles east, *i.e.* down-stream). This is a spot which cannot be mistaken or overlooked. Thence to the Lorian swamp is 100 miles, and the fall noted was 1 in 666. The stream flows quietly at about 2 miles an hour; there are no rapids, and the banks vary in height from 4 to 12 feet: the latter is unusual. Any one travelling on the right side of the river will observe the very large areas which could with ease and comparatively small outlay be brought under cultivation by irrigation works. It strikes one forcibly that no river could well be better adapted for irrigation

LORIAN SWAMP AND HIPPOPOTAMI IN THE MAIN STREAM OF THE GUASO NYIRO, INSIDE THE SWAMP. A SMALL AREA OF DRY GROUND.

purposes, for control, and the water even in the dry season contains much earth in suspension; a flood it would be greatly augmented. The climate is dry between the rain periods, the nights cool even at the Lorian swamp, the sun very powerful during the day, though a higher temperature than 93 in the shade was not observed. The paramount importance of water in Africa is fully appreciated in Africa—little can be done without it; its presence under conditions favourable for use should attract examination ere long. The natural outlet for this district would be across a waterless level expansion of some 50 to 60 miles, probably, to the Tana river and the coast. The Tana river has this year been accurately surveyed by a party of gentlemen, with the object of initiating steam transport, and of taking up land.

E 2

NOTES ON THE HISTORY OF THE NILE AND ITS VALLEY.*

By W. F HUME, D Sc. (Lond.), A.R.S.M., F.R.G.S.

THE river of Egypt, spreading its beneficent influence in regions where barren desolation otherwise holds sway, has throughout human history had a strange fascination for both statesman and student. By warlike expedition or peaceful exploration, the mystery of its origin has been unravelled, and to-day its great feeders, the White and Blue Niles, and the Atbara, have been traced into the heart of the fastnesses where they have their source.

CONTRAST BETWEEN THE WHITE AND BLUE NILE SYSTEMS.

At the outset a contrast of a striking character is apparent when the two main river-systems are compared, for the upper Nile, or Bahr-el-Gebel, passes without any marked break from the condition of tumultuous youth to one simulating all the characters of fluviatile old age. From north of Dufile (about 5° 45′ N.) it sweeps through a narrow ravine, rapid succeeding rapid, then suddenly emerges into the plain tract at Gondokoro, anastomosing channels, ox-bow lakes, and the intricate meanders of the sluggish stream all bearing witness to its apparently senile condition. But once again, where the Bahr-el-Ghazal and Sobat join, its character changes, the river regains something of its earlier vigour, and, already many a league south of Khartum, flows northward; it is often over a kilometre in width, bounded by low banks, and studded in places by lines of graceful acacia. Lake and meander have disappeared, replaced in the early spring by innumerable sand-banks, where assemble heron and ibis, pelican and Nile goose, lending animation to the otherwise monotonous and silent scene.

If we consider the mountain tract of a river as the region of maximum erosion and backward growth, its valley tract is that of transportation, such erosion as there is being mainly vertically downward, while the plain tract is the region of deposition and lateral erosion; then the Blue Nile may be said to have no plain tract in any part of its course. From the cataracts of Rosaires to Omdurman during flood it is but the transporting agent for the erosion products of the Abyssinian hills, the banks which border it on either side showing but little evidence of erosion by the turbulent flood-waters. It may therefore be regarded as at the valley stage of its existence in its lower reaches.

In the following remarks it is proposed to deal with those river

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problems of which the writer has had personal experience, and to offer answers to some of the questions which force themselves upon our attention.

THE GREAT PLAINS OF THE SUDAN.

Standing on the summit of Gebel Auli, a low elevation dominating the river some 25 kilometres south of Khartum, the observer sees spread at his feet one huge plain extending between the White and Blue Niles, while only far to the west in Kordofan rise isolated hills, relics of a once existent plateau. Standing and gazing over this expanse, which is studded with circular arrak bush or groves of acacia, the question forcibly presented itself, How did it originate? Was it the bed of a great lake, or the result of an action still proceeding? The traveller in the deserts of Egypt, and especially one traversing the vast waste which spreads westward to the uttermost confines of Africa, will have no difficulty in recognizing that this apparently boundless plain owes its existence to the hardness of an underlying rock-stratum. This factor, too, has determined the plateau summits of the limestone hills which form the eastern sentinels of the Nile valley in Northern Egypt, but in the expanse extending at our feet, and in the low cliff which borders the slow-flowing river, there is no evidence of an unyielding rock surface, against whose solid foundation the atmospheric agencies have struggled in vain.

But Egypt has another type of plain of very different nature and origin which arrests the attention of every visitor, and is in strong contrast to the sand-swept desert wastes. This is the famous Delta, in whose fertile fields we recognize the final resting-place of the rich soil borne by the silt-laden waters of the Nile from its far distant home in the volcanic hills of the Abyssinian plateau. Not denudation, but deposition, has played its part in the development of this land, which throughout all history has been a scene of agricultural industry and a source of wealth to successive empires. Is it, then, to deposition by rivers that we must look for the solution of our problem, the origin of the Sudan plains? The best answer I have yet received was given me by Captain Lyons, who called my attention to a most interesting memoir by Willard J. Johnson, on "The High Plains (of Western America) and their Utilization," in the Twenty-first Annual Report, 1899–1900, United States Geological Survey, Part iv., Hydrography, whose main conclusions were, in his opinion, applicable to the problem, so far as the Eastern Sudan plains are concerned.

These are as follows: One of the characteristics of desert mountains is a far-spread foot-slope, composed of their own waste products. The great plains of America, which in their vast dimensions resemble those of the Sudan, are in a sense such a slope, the mountain *débris* overlying the bed-rock to a thickness of over 200 metres, whilst their present

surface grade is not that of the original tilting. The whole structure has been formed in a series of stages. In the first stage, the mountain streams, traversing the plains, cut into their smooth structural slope and produce a topography of parallel broad valleys and ridges. In the second, ceasing to cut, they deposit instead, refilling the valleys they had excavated, and even burying the intervening ridges, resulting in the formation of a smooth upper surface. The original surface was a product of deformation, the second resulted from a destructive process of stream-erosion, the third is a product of stream deposit and construction.

In humid lands, the ground being saturated, the water is carried off along definite channels, and a river-bed, once formed, continues to be eroded until it reaches its base-level, as a rule that of the sea into which it enters. In a sub-arid zone, such as the Northern Sudan, the Abyssinian mountain region is relatively a humid tract, from which the streams run strong, carrying the materials of their erosion with them. As they issue into the desert properly so called, the greater number, receiving no supplies, dwindle and are absorbed; the larger part of their load, being deposited, builds up the desert surface, instead of being distributed at the bottom of the sea. At the mouth of each valley an alluvial fan of these materials is formed, and by the union of many such the plain surface is produced. The river Gash, near Kassala, which only flows for about eighty days in the year, is an admirable example of such a deltaic stream, and Mr. Dupuis, in his "Note on the River Gash," appended to Sir W. Garstin's Report,* clearly illustrates the close connection between the silt-laden torrent and the alluvial plain in which it is lost. Of the Atbara he says, "Next to its torrential character, perhaps the most marked characteristic of the Atbara is the way in which it persistently flows in a narrow valley or trench of great depth, which it has cut in the plain through which its course lies. This plain was no doubt originally formed by the river itself from the wash-down of the Abyssinian mountains, but owing to some change of conditions, possibly the gradual wearing down of the rocky barriers forming the cataracts of the Nile, the bed of the Atbara has for a long time past been gradually lowering itself into a channel of its own making, through the old alluvium, and in places into the rock below, and it now lies, almost throughout its course, in a narrow deep valley, with an eroding section, fringed by a belt of extremely rough raviny ground, rising gradually to the plain level on either side.

The great plains in the Eastern Sudan desert region may thus be the result of the gradual wearing back of the Abyssinian plateau, the deposits of whose rivers have been laid down on the evaporation of the

* 'Report on the Basin of the Upper Nile.' Cairo · 1904.

soil-bearing waters. Borings alone would reveal how far this explanation holds good for the plains south of Khartum.

While admitting that river action has in the main been the originator of the great eastern plains, the former existence of lakes is suggested by the vast quantities of impure limestone ("kunkar") present in the banks of the Blue Nile above Khartum. These are of some economic importance, as they supply the lime used in that city. An older formation was also observed underlying the modern alluvium at the village of Tura, 50 miles north of Duem, on the east bank of the White Nile, this consisting of a grey, sandy clay containing quartz pebbles and numerous very fragmentary remains, which Dr. Smith Woodward, F.R.S., has recognized as belonging to a siluroid fish and to *Polypterus*, both at present living in the Nile. Associated with these was the broken canine tooth of an extinct giraffoid animal related to *Samotherium* and *Sivatherium*.*

The time has not yet come for the solution of this portion of the Nile problem, but it is well that the facts obtained should be recorded for the purpose of discussion.

PONDING BACK BY STREAMS IN FLOODS.

The importance of this factor in geography has been emphasized by the recent studies on the basin of the White Nile (See Sir W. Garstin, *loc. cit.*, pp. 161–167).† Nothing, indeed, can be more remarkable than the contrast between the Blue and White Niles at times of flood. The Blue Nile, descending from the Abyssinian hills as a red-brown eddying surging torrent, sweeps across from the point at Khartum to the opposite bank at Omdurman, cutting off the light yellow-green waters of the White Nile, which break in gentle wavelets against the rushing stream as though it were a solid bank. At their junction long rows of pelicans, idly floating on the surface of a placid lake, seize the fish as they swim by, and the White Nile is pressed against the western shore, becoming a long thin wedge, which soon disappears, the only contribution of the White Nile to the flood-stream being portions of its lighter waters which are torn off and carried away by its swifter neighbour.

The same contrast was clearly illustrated by the discharge observations recently carried out. In the Blue Nile above Khartum, all was excitement and movement, the current meter making over one hundred and fifty revolutions a minute, every precaution also having to be taken to prevent disaster to the valuable instruments. So swift is the current

* See Cadell, "Development of the Nile Valley," etc., *Scot. Geogr. Mag.*, May, 1905, pp. 225–248.

† Also in "Some Problems of the Upper Nile," *Nineteenth Century*, September, 1905, pp. 845–867.

that the great stern-wheel gunboats passing upward to Wad Medani scarce made headway against the mass of waters. The White Nile, however, presented a complete contrast, for as the minutes sped by, the counter of the current-meter remained silent, and not a ripple disturbed the mile-wide surface.*

Gradually, as the flood-waters subside, the lighter waters of the White Nile contribute an increasing share to the volume of the combined stream, until during the early summer the conditions are almost completely reversed.

This ponding back of one stream by another in flood is no isolated case in the Nile valley, for Sir W. Garstin remarks (p. 162), "There can be little doubt that the waters of the Sobat, when in flood, hold back those of the White Nile, for a long distance upstream of the junction," the discharge data supporting this statement being then given. Similarly, he remarks on p. 168 with regard to the Atbara, "It seems probable that the Atbara water, when in full flood, holds back that of the Nile to a certain extent, as, during this period, the volume of the former river forces that of the latter across to the western shore. Without permanent gauges, and a series of discharges above and below, it is impossible to verify this supposition."

From Omdurman, where the Blue Nile and White Nile meet, the united rivers sweep on, past the broad sandstone plains and sandstone hills where Dervish power fell, past palm-groves and fields once green, now overgrown with poisonous Sodom apple (*Calotropis procera*), sad relics of the devastation when the Jaalin tribe was swept away by Dervish raid and ravage; but already a new condition of things is foreshadowed, where a felsite ridge extending across the Nile leaves a ravine 200 metres broad, through which the river flows in one steady and rapid stream, forming the Shabluka, or sixth cataract.

THE CATARACTS.

North of Berber, the river commences in earnest that period of troubled existence which is only terminated at Wady Halfa or distant Aswan. How did these cataracts originate? Why thus, in the very midst of its seaward journey, should the Nile again become a mountain torrent, with difficulty recognizable as the same grand stream which sweeps past Omdurman? One fact stands out pre-eminent—it is the geological structure of the country which has determined the position, the extent, and the nature of these barriers. It may be recalled that

* The maximum mean velocity of the Blue Nile as recorded on August 21, 1903, was 2·796 metres a second, or over 6 miles an hour, but the surface velocity would probably be nearly double this figure. In a recent paper by Captain H. G. Lyons in *Geog. Jour.*, September, 1905, pp. 259–262, full details of these observations have been published.

from Aswan to at least as far as Khartum, the desert on both sides of the river is fundamentally composed of the Desert, or so-called Nubian sandstone, overlying igneous and metamorphic rocks of totally different structure and composition, granites and gneisses (as at Aswan), or the intense black and deep green dolerites, slates, and schists, as at Wady Halfa. Had these beds preserved the normal dip to the north-west, the river should have passed from these older cataract-forming rocks to the sandstone, and the upper reaches should have been the scene of confusion, while further north the stream should have rolled its placid course to the sea. This, however, is not so. Whether as parts of the old continental floor, or due to gentle folding, the older series from time to time reaches the surface, and the Nubian sandstone outcrop is bent back away from the river. Immediately, nay, abruptly, the scene changes with the rock-change. Standing on the old tomb of Abu Fatma, near Kerma, north of Dongola, two different pictures meet the eye. Gazing over the sandstone area desertward, all is flat plain, studded with stunted thornbush, and in the river palm-groves rise on Baidia island, and a hundred saqias * sound forth their monotonous music. But look northward, and the sandstone plain is giving place to rolling hummock and ridge of gneiss and granite, while at your feet, but a few metres north of the junction of the two different rocks, the water is pouring over a rock bar, the first rapid of the Hannek or third cataract, and beyond is maze of island and channel, where the sound of the turmoil is never still. But why should there be a cataract even here? One of the answers is to be found in the fact that the rocks are not homogeneous; the gneiss, which here is the fundamental member, has been traversed by striking bands of granite extending far into the desert east and west, where they cross the river, narrowing it, and obliging it to pass through the few openings in the hard granite where it has been able to force a passage, so that each rapid consists of a series of islands in a straight line separated by channels of turbulent waters. Shooting the principal cataract in the spring, but little space is left between the rock walls, and the slightest mistake of navigation would mean certain destruction. Leaving the definition of the varieties of hard rock which have played this part in the history of the Nile, it is yet necessary to emphasize that one method of cataract origin is having a band of hard rock traversing the river-bed, this being at the third cataract in the main hard granite rising through softer gneiss.

The Kaibar, which for the greater part of the year is an absolute barrier to all Nile navigation, owes its origin to a similar cause, but with this difference—the hard band is gneiss, the softer sandstone otherwise surrounding it on all sides.

* Egyptian water-wheel.

But the presence of rock-barriers is not the only source of origin of rapids in the Nile valley. The finest cataract near Wady Halfa is the Bab-el-Kebir, which, during the flood season, is a foaming mass of water restricted to a narrow channel, whereas in winter it is an almost dry ravine filled with boulders. Here the walls are composed of one of the hardest of rocks, whose original erosion seemed difficult to imagine, till further search showed that down the centre of the gorge ran a thin dyke of a softer rock, a porphyrite, by whose erosion the original direction of the rapid had been determined. This second method of origin may be further illustrated by the remarkable conditions revealed during the cutting of the Aswan dam, where it was shown that many of the cataract channels were due to the presence of a soft schist intercalated between the bands of granite rising through it, and the unusual sight could be observed of the soft rock-masses being dug out with spades. *Some of the important Nile cataracts, therefore, have originated at points where soft bands traverse the hard ones in the direction of the stream.*

There is also a third method of origin. Earth-movements often give rise to fractures or faults, and these also occur in some of the cataract areas, one being well displayed near the Aswan dam, where in the cemetery valley one side of the ravine is composed of granite and the other of sandstone, which normally overlies the granite. There seems little doubt that the transverse channel of the Bal-el-Kebir at Aswan was formed along the continuation of this line of weakness.*

It is here suggested, therefore, that the cataract-formation in the Nile is due to one or all of the following elements, it being a primary condition that igneous or metamorphic rocks are essential to their formation:—

1. Hard bands in soft rocks, traversing the river at right or acute angles.
2. Soft bands in hard rock, running parallel to the river's direction.
3. Lines of fracture producing a plane of weakening between hard rocks.

The formation of the Nile cataracts, therefore, illustrates in its widest sense the elementary principle that where rocks are homogeneous, cataracts *are absent;* where rocks are not homogeneous, rapids and cataracts *will undoubtedly be present.*

North of Aswan the scene again changes. Though the Nubian sandstone frowns in massive cliffs above the Nile at Silsila, yet there are no cataracts; faults on a large scale have torn the rocks asunder in the

* The importance of faults in the formation of the Aswan cataract has been recently urged by M. Fourtau in a paper read before the Cairo Geographical Society. These fractures had previously been studied by Dr. Ball, and the details will appear in the Geological Survey report on the first cataract.

desert near Qena, but on the river itself these movements have had no visible effect. It flows on more and more markedly between cliffs, first of sandstone, and then of limestone, until south of Luxor it passes from a probable valley of erosion to the proved portion of the Nile fault depression.

In conclusion, the probable geological history of this portion of the country may be briefly restated. During the Eocene period the sea apparently spread over the whole of North Africa; then step by step shallowed, till finally it was replaced by the Upper Eocene continent, where flourished those great mammalia whose remains to-day form one of the most valued possessions of the Cairo Geological Museum. Again, in Miocene times, the Mediterranean advanced northward to Vienna, absorbing the Black Sea and Caspian, southward covering the desert between Cairo and Suez, and extending some distance south along the line of the present Gulf of Suez. Then came a period of gigantic disturbance of the Earth's surface. Owing to great earth-foldings, the Alps and Himalayas as we now know them were called into existence, and in Egypt these movements were reflected by fractures and rifts which have left indelible and fundamental marks on the structure of the country.

It has now been proved that the sea advanced up the Nile valley at least as far as Minia, subsequently receding gradually, lake succeeding sea, and river succeeding lake. On the period of disturbance followed one where glacial conditions reigned over Northern Europe, this being represented in Egypt by the Pluvial or Rain period of Prof. Hull, when Red Sea Hill rocks were rolled down by torrents, forming the gravel beds of Wadi Qena and Dendera, while the Nile stream itself was sufficiently strong to carry these far north, so that in the gravel deposits underlying the Nile valley alluvium boulders of flint and limestone over 4 inches in diameter are frequently met with, as, for example, in the borings made for the Cairo water-supply.

To these gravels succeed sands, which have been noted in every boring yet made in the Nile valley; and, finally the Nile mud, which in the aggregate seldom exceeds 8 metres in thickness.

Thus the Nile, as we now know it, is both the product of mighty disturbances and of peaceful erosion. Its mud-laden flood waters are the witnesses of storm and stress in the Abyssinian highlands, its summer stream a memory of the lakes of Uganda, and the delta spreading mile-wide as one vast sea of cultivation, the record of a hard-fought fight between great rivals where sea and river meet.

CANAL IRRIGATION IN THE PUNJAB.

By Captain C. H. BUCK, I.A., Punjab Commission.

FEW people in England have any idea of the vast irrigation systems of India, and I propose in the following lines to place before the British public a brief description of the canals and areas irrigated by them in the Punjab. In order to understand the system, it is necessary to have a slight acquaintance with the geography of that province, and a glance at the rough map will show how the land lies.

The Punjab (*pŭnj* = five, *áb* = waters), as every one knows, derives its name from the five large rivers, Jehlam, Chenáb, Rávi, Beas, and Sutlej, which find their way across it from north-east to south-west. On its western boundary rushes the Indus, while on its eastern side flows the Jumna; the Himalayan mountains lie along the north-eastern side and form its watershed, while in the northernmost corner is a tract of high hilly land divided from the plains by the Salt range.

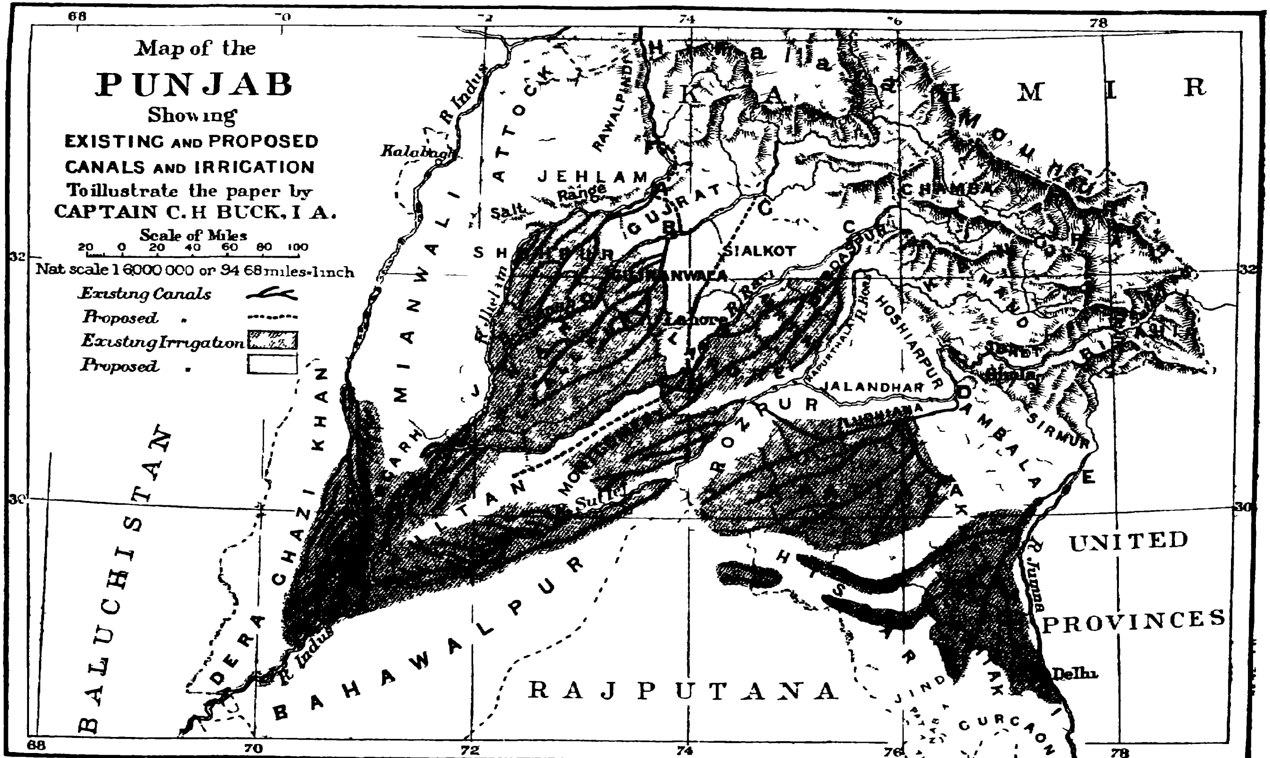
The land between each of the five rivers and between the Sutlej and the Jumna, south-west of the Himalayas, is to the eye as flat as a pancake, but there is in reality a gradual incline towards the south and south-west, so that any canal, which has its head near the hills and on the left bank of any of the three rivers first mentioned, is able to command practically all the land to the west which lies between the river it takes out from and the river next on the south. Canals from the Sutlej are likewise able to command large areas on the south of its course, but the Beas has not been utilized, owing to the land between it and the Sutlej being rather too high.

The principal perennial canals at present existing in the Punjab are as follows: A, the Jehlam canal; B, the Chenab canal; C, the Bari Doab canal (*Bári* is a unison of the two names Beas and Ravi, *do* = two, *áb* = waters); D, the Sirhind canal (*Sir* = head, *hind* = India); E, the Western Jumna canal.

In addition to these there are numerous small inundation canals, which give a supply of water along the sides of each of the five rivers and of the Indus when they are in flood during the hot weather; these are shown on the map by small lines.

Of the twenty-eight districts in the Punjab, only Mianwali, Attock, Rawalpindi, Gujrat, Sialkot, Kangra, Hoshiarpur, Jalandhar, Ambala, and Simla are without canal irrigation, but most of these are so situated that they derive much benefit from small hill torrents, from the cooler climate and natural moisture in the soil, or from the fact that the water in the wells, on which they principally depend, is only 15 to 30 feet below the surface.

Of the canal-irrigated districts, Hissar and part of Rohtak are the worst off; they are at the tail end of the Western Jumna canal, and



Map of the
PUNJAB
Showing
EXISTING AND PROPOSED
CANALS AND IRRIGATION
To illustrate the paper by
CAPTAIN C. H BUCK, I A.
Scale of Miles
20 0 20 40 60 80 100
Nat scale 1 6000 000 or 94 68 miles-1inch
Existing Canals
Proposed
Existing Irrigation
Proposed
KASHMIR
JAMMU
CHAMBA
ATTOCK
RAWALPINDI
JEHLAM
Salt Range
GUJRAT
SIALKOT
GUJRANWALA
Lahore
HOSHIARPUR
JALANDHAR
LUDHIANA
AMBALA
SIRMUR
Simla
KAPURTHALA
MIANWALI
DERA GHAZI KHAN
BALUCHISTAN
BAHAWALPUR
RAJPUTANA
HISSAR
ROHTAK
JIND
GURGAON
Delhi
UNITED PROVINCES
R Indus
R Jhelam
R Sutlej
R Beas
R Ravi
R Jumna
Kalabagh
68
70
72
74
76
78
32
30

the former receives very little water, while the water-level in the wells in both districts is a great distance below the surface, and both are subject to periodical droughts.

Mianwali and the northern portion of Muzaffargarh and western part of Shahpur consist to a large extent of Government waste, and are at present unirrigated.

The perennial canals A to E, with their main branches, are shown on the map by lines, and these, with their distributaries and water-courses, form a gigantic network of channels throughout the areas, shown shaded on the map. The tracts depicted by cross-hatched lines are those for which a new project, recently sanctioned by Government, has been conceived.

There is in the Jehlam a large surplus of water—and sometimes a certain amount in the Chenab—which hitherto has run to waste owing to the inability of the existing canals to carry more, and to the land commanded by them receiving as much water as is necessary; on the other hand, the Ravi, which is a smaller river, frequently dries up altogether in its lower reaches during the cold weather, and all the water which comes down it from the hills is taken off at C by the Bari Doab canal; a great area of Government land is lying waste in the Gujranwala, Montgomery, and Multan districts, and a remarkably ingenious plan has been thought of for the irrigation of these tracts. A canal— to be called the upper Jehlam canal—will be dug from F, and carried round the end of a small range of hills in the Gujrat district, thence in a south-easterly direction until it runs into the Chenab just above B, the head of the Chenab canal. Another canal —called the upper Chenab canal—will be constructed from G, through the Sialkot, Gujranwala, and Lahoré districts, to a point, H, on the Ravi; here it will be carried by means of enormous syphons under the river, and thence across the western corner of the Lahore district, through Montgomery into the Multan district; after passing the Ravi this canal will be known as the lower Bari Doab canal. Sufficient water for canal A will always be allowed to pass down the Jehlam, and of the remainder as much as is required will be taken off by canal F to irrigate the hatched portions of the Gujrat and Shahpur districts, and to fill up the supply in the Chenab for canal B. Water will thus be available in the Chenab for canal G, which, before passing under the Ravi, will irrigate a small portion of Sialkot and the greater part of Gujranwala.

I think I may safely say that a bolder irrigation scheme has never before been adopted.

There is yet another large scheme on the *tapis*, and that is the Sind Sagar project to irrigate the tract south of the Salt range between the Indus and the Jehlam; there has been a certain amount of doubt as to the feasibility of constructing a canal through this tract, owing to its

surface being composed to a great extent of undulating sandhills; it is certain that its cost would be enormous on account of the difficulties which would be incurred, and it could hardly be a paying concern, but would be a sound protective measure. The head of such a canal would be on the left bank of the Indus, somewhere near Kalabagh.

During the last twenty years the canal system of the Punjab has received an enormous impetus; the western Jumna, Sirhind, and Bari Doab canals—the latter especially—have been considerably extended, and numerous new inundation canals have been constructed, while the Chenab and Jehlam canals have been made and colonization operations on the former successfully carried out, and those on the latter placed in full swing. The next twenty years will, with the further developments I have already mentioned, show a similar, if not greater, advance.

A few figures will show what a wonderful success the Chenab canal has proved financially. Before colonization operations commenced, the 1,800,000 acres of Crown waste only gave a revenue of a few hundred pounds on account of grazing rights, while now the same land pays a revenue of over £70,000, in addition to the water and other rates credited to the canal. This canal commands over 3,000,000 acres, and irrigates annually about 2,000,000 acres, while there is a net profit to the State of £450,000, which gives a return of 23 per cent. on the capital cost. The annual value of the crops on the land irrigated by this canal amounts to about £4,000,000 sterling, and the total value of goods carried in 1904 from the new railway—which passes through the tract commanded by the canal—and exported from the port of Karachi amounted to about £2,800,000. These goods consisted, among other things, of 357,000 tons of wheat, 100,000 tons of other food grains, oil-seeds, and cotton, and the total freight paid was over £450,000.

The Jehlam canal is designed to command about 1,100,000 acres of culturable land, and will pay over 15 per cent. on a capital cost of $1\frac{1}{4}$ million sterling, while the estimated expenditure on the upper Jehlam, upper Chenab, and lower Bari Doab project, which will command over $4\frac{1}{2}$ million acres of culturable land and irrigate almost 2,000,000 acres, amounts to a little more than £5,000,000, and is expected to give a direct return of 10 per cent. on the capital outlay.

The length of the main lines of the existing Punjab canals exceeds 3000 miles, while that of the branches is over 2000 miles, and of the distributaries about 12,000 miles. When it is considered that the main line of the Chenab canal has a bed 250 feet wide, carries a depth of almost 11 feet of water, and discharges 10,800 cubic feet per second—or about fourteen times the amount ordinarily discharged by the Thames at Richmond, some idea may be obtained of the magnitude of the whole system, and the wonderful achievement of the engineers who designed and constructed these canals. To the ordinary onlooker it is little

short of marvellous how the water is controlled so that each little watercourse receives its supply at regular intervals, and each cultivator is enabled to irrigate his land as his turn comes round. It is also wonderful how the levels are all accurately taken over vast stretches of barren waste and the position of even the smaller channels marked out, so that the water flows to the nethermost corner when they have been dug and opened. As a matter of fact, the discharge through the head-works of a canal can be regulated to a fraction by means of sluice-gates; while the amount each branch and distributary is to take, and the periods they are to take it for, are all worked out by simple formulæ; and the telegraph lines, which flank all the main channels, are used for conveying the necessary instructions. Then, at certain points along the main lines, branches, and distributaries sluice-gates are placed in connection with channels leading back to the river or to depressions, so that surplus or flood water can be allowed to escape when necessity arises.

Working at the construction of a new canal through an inhabited tract of land, as may be imagined, is much more pleasant than the making of one through what is practically a desert. In the latter case, one has the greatest difficulty in getting supplies and accommodation both for one's self and for the subordinates and labourers; in fact, on first starting, one sometimes has to live and work in a tent, when the temperature in the shade is over 115° Fahr. Some time before a new canal through Government waste is completed an Indian civilian is appointed to supervize the colonization operations, and his work may be said to be never-ending. Under the guidance of this officer, who is generally helped by an assistant—also an Indian civilian—a huge establishment has to survey the tract, mark it out into squares of about 27 acres each, divide it into various circles for administration purposes, and again into villages. As soon as the preliminary arrangements have been made, the squares have to be allotted to settlers. The classes, and approximate numbers of each class, and the districts they are to be obtained from, are decided on by Government, in consultation with the colonization officer, but this officer is given a fairly free hand in obtaining them and in allotting the squares.

The land is granted mostly to peasants selected from congested districts and from neighbouring riverain villages when their land has in any way suffered by reduction of water in the rivers, but a considerable area is set aside for distribution among Government pensioners, both civil and military, who have done good service, while occasionally a few thousand squares are put up to auction in large plots in order to introduce a capitalist element into the colony. The ordinary peasant grantees receive only one square apiece, but those who are of good family or high standing in their old districts, or who for some reason deserve a reward, frequently receive a larger grant, which may extend to ten squares, but usually to not more than five. Native cavalry regiments

were offered grants of from sixty to a hundred squares for the establishment of remount depôts and horse-breeding farms, and most of them have taken advantage of this. In the Chenab colony (now known as the Lyallpur district) three camel-transport corps are maintained by granting squares on certain conditions to camel-owners. Among the provisos is one by which the grantee has to maintain one male camel fit for transport duty, and three female camels for each square he has received; when called upon for active service, the grantee has to provide one driver for every three camels.

Among his numerous other duties, the colonization officer has to arrange for the sites of the towns and villages; for those of buildings, such as hospitals, schools, police-stations, and other public offices; space has to be reserved for factories along the railway; and plots have to be kept for aboricultural plantations and nurseries, and for an experimental farm.

Besides the more practical operations, there is an enormous amount of head work to be done in the way of deciding the rates to be charged for water-supply and land revenue, etc.; the records, too, which have to be started and maintained, regarding the rights in the various holdings, the crops grown, and the revenue, rates, and fines to be collected, suspended, or remitted, are innumerable, and the forms for all the necessary registers have to be most carefully drawn up.

The settlement of the tract irrigated by the Chenab canal was the first large colonization project in the Punjab, and consequently was exceedingly difficult. The colonization of the Jehlam canal tract is now in full swing, and somewhat easier, for the officers in charge have the benefit of the experience gained in the formation of the first colony, and they can work on more or less well-defined rules.

Before settlers arrive in a village the streets and building-plots are all marked out, and as they appear on the scene they are allowed a certain amount of choice in the selection of sites for their homesteads and of the position of the squares they will cultivate. The site for the habitations is usually in the shape of a square or oblong, and consists of one, two, or more squares of 27 acres each, in accordance with the culturable area. In the centre there is usually an open space, in which only one small building is erected for use as a post-office, village surveyor's office, or for some other public purpose, and the village well. Around or close by this space are the sites for the village shops; small plots are also set apart for the residence of the headman and other rural officials. On the outskirts, at one side, an area is reserved for the huts of the menials and persons of low caste.

The houses in one of these villages are usually built of sun-dried earthen bricks, wooden beams, rafters, and posts. They have flat roofs, and are plastered inside and out with a mixture of mud and crushed straw. A few are occasionally made of more substantial materials, such

as kiln-burnt bricks, cement, and iron girders. Strict rules have to be made and rigorously enforced to ensure sanitation and the preservation of the public health; thus earth can only be taken from selected spots, which are afterwards used as tanks, and one of the most important is that which directs settlers to sink, within a prescribed period and from a common fund, a good well of burnt brick for drinking-water. In order to prevent persons building on land allotted to others, or in unauthorized places, and to stop outsiders squatting in villages, heavy rents can be levied in the shape of fines, and it is sometimes necessary to impose these penalties before a village has got into proper working order.

While the colonization of one of these enormous tracts is proceeding, arrangements have to be made for the extra police and the criminal, civil, and revenue courts, which become necessary owing to the rapidly increasing population, and, as the colony develops, it is at length found expedient to form it into a new district, with a full staff of civil and police officers. A local board is then formed, which deals with the hospitals, schools, roads, and buildings, and a great deal of work is taken off the hands of the colonization officer, who can thus devote himself entirely to the final settlement of the colony.

The construction of a new canal through a large stretch of waste land results, of course, in a great development of agriculture and trade, besides an increase in the population; consequently one of the first matters to be considered is the communications. The railway and the main roads have to be ready when the canal is opened, so that the colonists can sell their surplus produce and send it away. As the irrigation is extended, feeder lines have to be constructed and more rolling stock obtained. Not only does the railway department have to keep its eyes open, but the postal, telegraph, and other Government departments also have to advance with the times.

The colonization officer is consulted by one and all, and he has to be ready at all times with information on even the most minute details. It will thus be seen that the duties of this officer are exceedingly heavy, and the post can only be filled by a man of tact, great capability, and immense capacity for work.

That Government does not demand too high a revenue from the colonists is distinctly proved by the fact that hordes apply for grants and have to be refused. I may mention here that a peasant who has good land in a colony is able to make a clear profit of £30 per annum per square, while even an inferior square will give him a profit of £15 to £20 per annum. This may not seem a very fat income to an Englishman; but it must be remembered that a native can easily support himself and a large family on £12 a year.

In conclusion, I have to say that the extension of irrigation has conferred a great boon on the people of the Punjab. Labour is always to

be obtained, and those tracts affected by drought send forth their thousands to work in the colonies and on the canal-irrigated lands, so that famine in the Punjab is almost a thing of the past. Owing to the fact that the colonists and their friends and relations pass to and fro between the various parts of the province and the colonies, the people generally have more intercourse with one another, and are becoming more open-minded. Factories are now quite numerous, and trade generally has rapidly improved, while the money circulation is much greater than heretofore, and I think I may truly state that the eyes of the masses have been opened to the great benefits they are receiving under British rule.

NATURAL MOUNDS IN CAPE COLONY.

By ERNEST H. L. SCHWARZ, Professor of Geology, Rhodes University College, Grahamstown.

THE interesting discussion that has been going on in the columns of *Science* with reference to the subject of Natural Mounds in the United States, which was noted in the Monthly Record for August, has prompted me to write the following note on a similar occurrence in the coastal districts of Cape Colony. It has long been a subject of interest to me, and I have several times tried to come to some conclusion in regard to their origin, but, like Mr. Veatch, have not been able to satisfy myself that any explanation brings us nearer the solution of the problem. The theory that they are disintegrated ant-hills, favoured by Prof. Hilgard, brings in the least amount of speculation, for ant-hills are very prevalent all over South Africa, and I have even seen them on Micham common, near London, distributed over the surface in the same manner as our natural mounds occur in South Africa. Mr. Purdue's objection that the ant-hills found in among the natural mounds are very much smaller than the latter is not of such weight in the Cape Colony, as the species of termites that formed the mounds—supposing for the moment that the ant-hill theory holds good—may very well have been the same as that which builds the huge ant-hills in Rhodesia, but which have died out in the south of the sub-continent. The bones of the eland and rhinoceros in the sand-dunes round Cape Agulhas show that these animals, now confined to the north of the Orange river, once lived in the country of the natural mounds, and as it is probable that climatic change, as well as the presence of the white man, has exterminated the larger animals in the south, so it is not unreasonable to suppose that the Rhodesian termites once lived in the south also.

In the colony the mounds may be seen in any sandy ground near the coast, covering the surface with bare patches; but the want of vegetation is due, I think, not to the nature of the soil, but to the

baking of the surface, after it has been wetted by the rain, by the intense heat of the sun. Where a wheel has gone over one of the mounds and broken the hard crust, bushes spring immediately. In cultivated land the farmers aver that these hillocks are more productive than the rest of the soil, and Mr. Juritz, senior analyst of the colony, mentioned in his address to the British Association in Cape Town, that a levelling of these hillocks results in an increase of the fertility of the soil all round.

The most accessible place for seeing these mounds is on the lower slopes of the hills of Bokkeveld and Witteberg beds on the top of the Hex river pass, on the main line to Johannesburg; they appear as red splotches on the bush-covered slopes. The elevation here is only a few inches, and the diameter some 5 or 6 yards. In the Malmesbury district they occur on the flats below the hills, and are formed of light yellow argillaceous sand. Here they have usually a depression in the centre, which is often occupied by a clump of arum lilies, although the surrounding country is far too dry for these moisture-loving plants to exist.

After seeing these Malmesbury mounds I went into the Ceres Karroo, and at Hartnek's kloof found an actual spring bubbling up from sandy ground, and round each of the eyes there was a perfect circle of grass, raised a few inches above the general surface. I afterwards saw many of these sand fountains, and for a time my mind veered round to an aqueous origin for the hillocks.

East of Worcester, however, near the station Over Hex, there is a large tract of country under the Langebergen, covered by a fine yellow alluvium, not unlike loess in texture, and a great portion of this is occupied by gigantic hillocks some 8 to 12 feet high and some 10 yards in diameter. In places these are so closely packed that the bases mutually impinge; the angle of slope varies, but often is as acute as in a volcanic cone. There are many good sections of the mounds available along the railway here and in the road-cutting, but nowhere is there any internal structure visible; the whole substance of the hillock is the same throughout, and consists of fine argillaceous sand like the surface soil, without the least sign of vegetable or animal remains included in it. The soil becomes so hard where it is allowed to dry quickly after being moistened, that square blocks can be dug out and sun-baked, and can then be built into walls, where they will stand unprotected for many years.

In the red-sand country of Bushmanland the mounds also occur, and the substance of the hillock is more argillaceous than that of the surface soil; the bushes grow closely packed together on these spots, which are perfectly circular, although the rest of the ground is sparsely covered except after rain, when the grass grows. I never noticed our donkeys feeding on these clumps, however, although the luxuriance of the bush ought to have attracted them.

Another possibly connected phenomenon is that of the small patches of poison veld that occur in among the ordinary veld with apparently no cause for the nature of the bush. I know two such patches in the colony, one high up under a krantz in the Nieuweveld, and the other in the open plains north of Matjesfontein. The areas are a few acres in extent, but there is no demarkation between the good and the bad veld; the bush is the same in both, and the farmers say that the plants absorb their poisonous properties from the soil. That these areas are very poisonous I had ample experience, for when I was outspanned near the Matjesfontein patch, a drove of slaughter-oxen came down from Sutherland and wandered into the poison area, and three or four were immediately stretched stiff on the ground. Similarly, a little blue iris that grows plentifully throughout the country in some places, Baviaan's Kloof, for instance, and at certain times of the year, becomes very poisonous to cattle, while at other places it is apparently harmless.

The opposite of the hillock veld is the Kommetje* veld, where the ground is honeycombed with little shallow depressions. I have not seen a typical spot, but on the flats to the north-east of Fort Beaufort there is a fair example of this kind of surface. The ground was cut level by marine denudation, and in the shelves at present awash with the tide there is a layer of calcareous sand, which becomes hardened into limestone by the deposition of calcium carbonate. The process by which this is brought about is probably that the sea-water, containing a certain amount of lime in solution by reason of a small amount of carbonic gas held in it also, becomes left behind at low tide, and becomes warmed by the heat of the sun; when this happens, the carbonic gas is driven off, and the lime is thereby precipitated, and goes to cement the sand-grains together. The limestone forms low reefs enclosing shallow pools, which are alive with shore-forms of marine life. It seems probable, then, that when the sea retreats from off such a shelf the hard rims of these pools will persist, and afterwards, when they become removed, together with all the other material deposited on the hard rock when it was awash, the lime of the rims will sink into the underlying surface and harden it; the flat surface will be thus parcelled out into areas within which the rock will be softer, and under the action of denudation will become covered with shallow depressions. The true kommetje veld, however, has been described to me as one succession of circular hollows in similar aggregation to that of the hillock, and thus the hillock and saucer may be related in origin. The discussion of depressions, however, includes that of the pans in South Africa generally, some of which are 20 miles in diameter, and the subject is too complicated to be referred to in this note.

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* *Kommetje* = saucer.

THE GEOGRAPHICAL CYCLE IN AN ARID CLIMATE.*

By Professor W. M. DAVIS.

THE geographical cycle is a name for a long period of time in which an uplifted land-mass will, if no disturbance occurs, be worn down to baselevel by the processes of erosion. The cycle will be longer in a region of resistant rocks, and shorter in a region of weak rocks. During its passage the changes from the broad-featured initial forms produced by uplift and deformation are followed by the more varied sequential forms due to the active processes of valley erosion, and these in turn are succeeded by the monotonous ultimate forms of planation at baselevel. The succession of forms through the cycle is so orderly and systematic in many respects that a landscape may be described in a general way in terms of the stage of the cycle that it has reached: thus the scheme of the cycle is of practical service in geographical observation. The essential features of this scheme were outlined some years ago ("Geographic Methods in Geologic Investigation," *Nat. Geogr. Mag.* 1, 1888, 11–26), and presented in more detail at the International Geographical Congress at Berlin in 1899 in a paper published in the *Geographical Journal* for that year, as well as in the *Comptes Rendus* of the Congress. There are, however, many departures from the simpler conception of the scheme; some of these were discussed in a paper on the "Complications of the Geographical Cycle" before the International Geographic Congress at Washington in 1904, and published in its *Proceedings*. Not only the forms of lands suffer changes during the progress of the cycle; the distribution of organic forms is also greatly affected by the slow changes of land-form through the cycle as well as by the accompanying normal changes of climate that accompany the degradation of a mountainous highland to a featureless lowland. Biologists are coming to take more and more account of the changes in distribution thus brought about, and are finding therein the solution of many problems of peculiar interest.

The usual conception of the cycle takes account of the action of the ordinary or normal forces of erosion, such as included under weather and streams. The action of the sea waves and currents on the shore-line should be therewith associated; the fullest statement of this aspect of the problem is to be found in the thesis of one of my former students, Dr. F. P. Gulliver, on "Shore-line Topography" (*Proc. Amer. Acad., Boston*, **34**, 1899, 151–238). But besides the normal forces of degradation there are two groups of special forces; the one is characteristic of a cold or glacial climate, the other of an arid or desert climate. The first of these I have briefly considered in an article on "Glacial Erosion in France, Switzerland, and Norway" (*Proc. Boston Soc. Nat. Hist.*, **29**, 1900, 273–322). The point there urged is that we must not only study the forms produced by glacial erosion, but that we must arrange these forms in their order of development, and thus distinguish carefully between a district slightly modified by glacial erosion and a district profoundly modified by glacial erosion, as we do between a district on which ordinary erosion has just begun its work by cutting narrow valleys, and one in which the work has progressed much farther and brought forth a maturely and elaborately carved surface of hills and valleys.

The features of the arid cycle are more fully set forth in an essay bearing the same title as this paper, and published in the (Chicago) *Journal of Geology* (**13**, 1905, 381–407). Here the effort was made to follow the changes that an extensive

* Read at the Johannesburg Session, Section E, British Association, August 30, 1905.

desert region would suffer in a climate so dry that none of the initial depressions due to deformation were filled with overflowing lakes, that most of the streams formed by rainfall on the uplands would wither away as they descend, and thus fail to unite in trunk streams on the lowlands, and hence that no definite relation would be established with the normal baselevel of the ocean surface, such as obtains with so much force in the normal cycle, where all streams reach the sea, and hence carve valleys whose floors are graded with respect to sea-level or normal baselevel. The conditions of erosion in desert regions have been well studied by various writers, notably by Walther, in his 'Gesetz der Wüstenbildung' (Berlin, 1900); but suggestions of the greatest value in the present connection have come from the writings of Passarge, whose work on 'Die Kalahari' (Berlin, 1904) constitutes a very important contribution to desert morphology, and whose brief essay, "Rumpfflache and Inselberge" (*Zeitschrift deut. Geol. Gesellsch.*, **56**, 1904, Protokol, 193–209), announces a principle that will, I believe, gain wide recognition as of essential importance in the broader considerations connected with the evolution of desert regions. A brief outline of the arid cycle is here presented.

In a region whose aridity is determined by widespread climatic factors, an uplift of the Earth's crust may initiate a land surface of any structure, with any form and any height. The scanty rainfall will form streams here and there on the highland slopes, but they will not, as a rule, unite in trunk streams in the lower lands, nor will they form overflowing lakes in the basins. Each basin of deformation will therefore, in the earliest stage of the cycle, be occupied by a number of centripetal streams, constituting a potential but not an actual river system; and each of these systems will be independent of its neighbours. In strong contrast with the early stage of the normal cycle, when large trunk rivers actively entrench their valleys, and thus increase the variety of relief over its measure due to initial deformation, the processes of the arid cycle at once tend to decrease the initial relief by washing the waste from the highlands, and building up or aggrading the basin floors. True, the highlands will be locally dissected, but the aggradation of the basin floors will constantly tend to discourage the centripetal streams from cutting deeper in their lower courses. As time passes, adjacent basins may become confluent, not indeed by the establishment of a trunk river from one to the other, but by the development of a slope on which the waste may be washed—when rain happens to fall there—from one basin to the next. This may take place in two ways: The higher basin may be aggraded to such a height that its accumulating waste will rise to the level of the lowest point on the basin rim, when overwash and invasion of the lower basin will result; or the walls of the lower basin may be retrogressively eroded so as to drain or capture waste from the higher basin. Thus two previously independent drainage systems merge or coalesce into a single system; and as changes of this kind increase in number, the youthful stage of the cycle may be regarded as passing into the mature stage. As maturity advances, there will be an increasing coalescence of drainage systems, and an increasing regard for the control of the central desert baselevel, determined by the slowly aggrading and rising floor of the largest and lowest basin to which the other basins have become tributary. When maturity is so far advanced that the initial highlands of deformation are greatly dissected and degraded, we may picture the region as consisting of three kinds of surfaces; first, a central plain of aggradation with fine-textured waste towards its centre, but with coarser-textured waste around its margin; second, degraded, rock-floored plains veneered with irregular patches of gravels and sands, and graded so as to slope gently to the central aggraded plain; and third, residual mountains and hills composed chiefly of those rocks which best resist arid erosion. It is thus

seen that, if the terminology here suggested is adopted, the maturity of the desert cycle is the time of the greatest coalescence or integration of drainage, with which is associated a relatively small measure of relief; and thus the maturity of the desert cycle is unlike that of the normal cycle, in which maturity is not only the time of the fullest development of drainage processes, but also the time of the greatest measure and greatest variety of relief.

Thus far nothing is said of the action of the winds. In the normal cycle the winds are of little importance, because the plant-cover defends the surface of the ground from their action. In the desert cycle the winds are of great importance, because the vegetation is so scanty that the winds sweep the ground freely, and thus become important agents of erosion and transportation. While the relief is yet strong, as in youth, the winds are not dominant, for then the occasional rains have strong slopes to act upon, and make up for their prevailing absence by their occasional energy. But when maturity is reached, and great expanses of waste plains and rock plains have been developed, the winds may become dominant agents of erosion. It must here be remembered that the winds do not depend on the slope of the land surface for their acceleration; they are impelled to move by barometric, not by topographic, gradients; and barometric gradients may be dependent either on those wide differences of temperature that are determined by the spheroidal form of the Earth, or by those local and vertical differences of temperature which are instituted particularly on plains, and which result in violent whirlwinds and dust-storms. Furthermore, the winds are not systematically divided, like rivers, into branch and trunk streams, with steeper headwaters and gentler lower slopes. The winds are relatively unorganized; a light breeze may be succeeded by a sweeping samum; and, far from acting only in the direction of local slopes, the stronger winds may sweep sand along a level surface and even up a surface of significant grade. Indeed, the whirlwinds that occur so commonly on desert plains may raise dust far aloft, and give it over to the higher currents, which may then carry it outside of the desert region from which it was gathered, and strew it over neighbouring moister lands, or let it fall into the ocean. Finally, the winds have, in virtue of their unorganized manner of flow, no baselevel with respect to which their work is carried on; and in this respect a wind-swept desert resembles in a certain degree the bed of a river or of a glacier. The whole desert region is, indeed, the bed of the winds; and hence they may sweep out a basin here, where the rocks disintegrate into a fine-textured waste, or build up a mound there, where sands are supplied in excess of their removal. There can, therefore, be little question that the winds will thus in the later maturity of the cycle greatly disturb the integration of the drainage system previously established.

If the imagination be now given free play, and the duration of the undisturbed cycle be sufficiently prolonged, a new order of changes must be recognized. The long-continued removal or exportation of dust by whirlwinds and the upper wind currents must result in the very gradual degradation of the desert surface; and as the degradation goes on, there must be a progressive decrease in the area of the central waste-covered plain, and a corresponding increase in the area of the surrounding rock-floored plain; and if time endures long enough, the whole surface must thus be worn lower and lower, until practically all the central accumulation of waste in the largest and deepest of the original basins is exported; then a surface of bare rock, here and there veneered with a thin cover of waste, will everywhere prevail. The rock desert will even then continue to be worn lower and lower by the unceasing exportation of its dust; and there appears to be no reason why it should not—in a large continental desert area—be eventually worn below sea-level.

The form that the rock desert will assume after the winds have come to be the dominant agents of erosion and transportation is an interesting subject for inquiry. When it is remembered that the winds have no baselevel with respect to which their action is regulated, it might at first be inferred that they would in time excavate deep hollows wherever the rocks weathered into sand or dust. This curious condition of increasing relief with advancing old age is truly expectable in absolutely rainless deserts; but, as Passarge has pointed out, there is good reason for thinking that, in ordinary deserts, where rain occasionally falls in sufficient quantities to produce floods, the winds can never become so strongly dominant as to produce a very uneven rock floor. Wherever a shallow basin is initiated by the sweeping winds, the next rain will spread a sheet of sand and gravel over the floor of the depression, and thus very effectually retard or prevent the further deepening of the basin. As these accidents happen with advancing old age, the integration of drainage that characterized maturity will be seriously interfered with, and many small and independent drainage systems, indefinite and variable as to their borders, will be established, thus recalling something of the conditions of youth. Nevertheless, the region will still be a plain, except for the scattered residual monadnocks, or "island-mountains," as the Germans call them, even when the surface is worn down so low as to lie beneath the bottom of the deepest original basin, and hence to have a rock floor throughout, hidden only by the relatively thin veneers of gravel and sand that are spread here and there by the sheet-floods. It is important to add that the rock plain thus formed has no definite relation to baselevel, and thus differs essentially from the narrow plains of marine erosion, and from the broader peneplains of normal subaërial erosion, already familiar to geographers and geologists.

A geographical discussion so manifestly speculative as this one has intentionally been can have practical value only when the result of the speculations is shown to correspond to actual phenomena. It is the peculiar merit of Passarge's work that he has given good reasons for thinking that the broad rock plains of the Kalahari and certain other deserts, here and there floored over with thin sheets of gravelly waste, have actually been produced by such processes as are here sketched. But if this be true, and if the later stages of the arid cycle are thus actually verified in the South African deserts, there is ground for thinking that the other stages of the arid cycle will in due time be confirmed by the features of deserts in other parts of the world. The deserts of the world may then, as the more favoured parts of the world can already, be described in terms of a series of forms developed in orderly sequence during the progress of their appropriate cycle of geographical development, and a valuable addition will thus be made to systematic geography.

REVIEWS.

ASIA.

Eastern Asia.

'The Far East.' By Archibald Little. Oxford: Clarendon Press. 1905.

In this volume, which forms one of the series of 'The Regions of the World, Mr. Little has treated of the whole of the Chinese Empire, with its dependencies past and present, extending as far west as Chinese Turkestan, and also of Korea and Japan. His intimate and long acquaintance with China, and the special knowledge which he possesses of the Yangtse basin, lend an interest to the book

which more than compensates for any of the disqualifications for the task which, in his preface, he assigns to a writer so far from a literary centre as he finds himself in Sze Chuen.

Naturally enough, the country and provinces with which he is more intimately acquainted are more fully discussed than those which he knows only through books or as an occasional visitor. The chapter on Japan, which bears signs of having been written before the outbreak of the late war, is consequently very short compared with those assigned to China, and greater fulness of treatment is found in the portion of the volume assigned to the Yangtse basin than in those which consider the other portions of China and her dependencies.

Without in any way disparaging the rest of the work, the most attractive chapters are those which relate to Se Chuen and Shan Tung. In Se Chuen Mr. Little has made his home, and he writes of it with almost the affection of a native. In Shan Tung the attention devoted to the province by the late Baron von Richthofen has allowed Mr. Little to consider the geographical and geological features of the province in an exhaustive manner, which is fully warranted by the interest attaching to the province through the development which it is gaining by German energy.

It is more especially to the geography and geology of the Far East that Mr. Little devotes himself throughout, but incidental allusions to the industries and habits of the peoples, their history, commerce, and peculiarities, together with the author's theories on various vexed questions, such as the descent of the Chinese, etc., relieve what might otherwise be, perhaps, a heavy volume.

The author divides China into the Yellow river, Yangtse, and Canton river basins and the intermediate provinces (viz. Che Kiang and Fu Kien), which have independent water systems. The dependencies, which he speaks of as deliberately acquired by China with a view to their forming buffer states (p. 12), are Manchuria, Mongolia, Turkestan, Tibet, Indo-China, Korea, and Siam. The chapter on Japan includes Formosa, but the Luchu islands have not received any notice.

Baron von Richthofen's 'China' forms the base on which Mr. Little has built up his descriptions of the orography or geology of China; and for those parts of South China which are not described in Richthofen's great book, the author has apparently relied upon Mr. Kingsmill. No reference is made to the more recent theories regarding the mountain systems of China, which would appear to be continuations or prolongations of those in North-East Asia, having an almost uniform direction of east-north-east and west-south-west, a direction which is scarcely interrupted by the chains thrown transversely across them. Thus, Prince Kropotkin writes: "Instead of the mountains running west to east, or east-south-east, under the names of Tsin-ling-shan, Minshan, etc., which were formerly traced in the south of the Hoang-ho, we have here the terrace-like slopes, marked by three escarpments, running due north-east to south-west, by which the Tibet plateau descends towards the plains of China." This direction of the mountains appears to continue as far west as Kobdo, and to be found not only in the mountains in South-East China to which Richthofen gave the name of Nan Shan, but also to obtain throughout Hunan to the south-west of China. Dr. E. Tiessen, in his 'China das Reich der XVIII. Provinzen,' adopts the same theory of plateaux, escarpments and the north-east to south-west direction of mountain ranges, as Prince Kropotkin, and it would appear from his book that von Richthofen himself held the same opinion in the latter years of his life.

One of the most interesting chapters in 'The Far East' is that which tells of the engineering feat by which in the third century B.C., the plain of Chengtu was converted from a field of boulders into agricultural land irrigated throughout its

whole extent, 2800 square miles, and capable at the present day, thanks to the constant attention given to the maintenance and improvement of the works, of supporting the densest population to be found in China. The marvellous crops produced—according to Mr. Little, there are five crops in the year—are the more surprising in that sunshine is so rare that, according to a local proverb, "the dogs bark when the sun shines."

The maps liberally interspersed throughout the book cannot be said to be all of the same merit. Some are excellent, but that on Mongolia not only does not embrace the whole of the country reviewed in the articles, but adopts a different system of transliteration of the names of places to that followed by the writer. There is no good map of Manchuria; and the interesting meteorological charts on pp. 156, 157 lose half their value through the blurred type of the letterpress.

In a volume of so large a scope it is impossible that there should not be some errors and occasional contradictions. For instance, the population of China proper is estimated at 380 and at 300 millions in different parts of the book, and there is a curious statement that the population has nearly doubled during the last century, though Prof. E. H. Parker's tables show that the population in 1842 was 17 millions in excess of that in 1902, which he estimated at 407 millions. The prices of ginseng, wild and cultivated, are incorrectly given. It is, of course, the wild ginseng which is the more valuable, but in any case the prices quoted are too high. Again, Kowloon was not leased but ceded to Great Britain in 1860, when the lease previously granted to (Sir) Henry Parkes by the Governor-General of the Kwang provinces was cancelled. On the rendition of Ili to China, the country was not restored intact. The western portion, over 4000 square miles, remained in the hands of Russia. In the description of Formosa, it is necessary to warn the reader that the Taiwan mentioned as 2½ miles from An-ping is the old city of Tai-wan-fu now known as Tai-nan, and not the Tai-wan which figures in the map.

But these and other errors which occur are minor blemishes. Throughout the book there is great evidence of care and attention. The description of the ancient routes through Central Asia, and of the lines of approach to Yunnan from Burmah and Tonquin are chapters which especially illustrate this. If exception is to be taken to the book, it is rather on the score of the lack of information regarding the mineral products of China, and especially of that of gold in the west, regarding which so little has ever been made public. But those who are interested in China can hardly fail to find much in this volume which will add to their stock of information and stimulate them to further inquiry.

W. R. C.

Eastern Palestine.

'The Jordan Valley and Petra.' By W. Libbey, SC.D., Professor of Phys. Geography, Princetown, and F. E. Hoskins, D.D., Syrian Mission, Beirut. 2 vols. 159 *Illustrations*. New York and London: Putnam's Sons. 1905.

A pleasant but somewhat lengthy account of a holiday ride down the Jordan valley (east bank) to Karak, Tafileh, and Petra, and of the return to Jerusalem round the south end of the Dead sea. The authors describe in an interesting manner the chain of trans-Jordanic ruins which they passed from Gerasa to Petra, but with imperfect knowledge of their archæological character. The distinctions between Greek, Græco-Aramean, and Græco-Roman remains are more definite than they appear to be aware of. The structure and relief of the Ghor is treated with more science, but naturally in a summary manner, since the authors had no opportunity for detailed study. The theory which the authors formed as to the genesis of the actual landscape of the rift must remain unproven until

more evidence is adduced in its support than is given in these volumes. In these matters, as in some others with which they deal, the authors hardly show enough knowledge of what has been already done and written. The long and elaborate preparation which they describe themselves as having made for a short journey over fairly well-known routes seems to have disposed them to magnify both their novelty and their dangers. The slopes of Bashan, Ammon and Moab, immediately east of Jordan, are far from a *terra incognita*, and Petra is a resort of tourists. Even the northern part of the Darb al-Haj has been very often traversed and described, both before and since Doughty's classic account of it. The illustrations are good. The photographs of Petra are a fine set, and others show very well the superficial features of the eroded formations in Arabia Petræa. On the whole, however, it must be said that the book is disappointing. As a contribution to geographical science, it is hardly what one expects from Prof. Libbey's hand; while the eminence of one of its authors, and the scientific claim implied in many passages of it, preclude it from being regarded as a mere tourist's journal. The authors fail to make the measure of their own interest in their achievement the measure also of the reader's, and would have been better advised had they refrained from offering for public consumption much that no doubt interests their personal friends. The two volumes might easily have been compressed into one, and with advantage.

D. G. H.

POLAR REGIONS.

ANTARCTIC EXPLORATION.

'The Voyage of the *Discovery*.' By Captain Robert F. Scott, R.N., C.V.O. Two vols. Smith, Elder & Co. 1905.

The voyage of the *Discovery*! Never was a ship better named. Most important discoveries have been made from her during the last three years in all branches of science, as a perusal of this most interesting work will prove. No polar expedition has ever been better equipped for exploration amidst ice. None has ever been better commanded, nor has any polar chief ever had so efficient a scientific staff, or a better set of officers and men under him. To quote a phrase used by Captain Scott at the Albert Hall lecture, where seven or eight thousand people listened to him: "It was not a one-man's expedition, but one and all;" for each one of them worked as if the success of the expedition depended on himself alone, and these united efforts produced an harmonious whole, so admirably described in these volumes. They are dedicated to "Sir Clements Markham, K.C.B., F.R.S., the father of the expedition, and its most constant friend." Having been behind the scenes, I can quite confirm a remark of Sir George Goldie, that but for Sir Clements Markham there would have been no Antarctic Expedition. Sir W. Huggins, the President of the Royal Society, and the secretaries, more especially Sir A. Rücker, gave every assistance on scientific questions. I presume the instructions on those points emanated from the Royal Society, and I feel certain that that Society is as thoroughly satisfied with the results in its wide field as the Royal Geographical Society is of the work more especially its own. The travelling details were most admirably carried out. I can only regret, as I am sure every one of the *Discovery's* officers will also regret, that Sir Leopold McClintock, the father of modern polar travelling, to whom we owe several thousands of miles of Arctic sledge-travelling, which has contributed so materially to our knowledge of the coast-line of the Arctic Regions, could not, owing to failing eyesight at eighty-four years of age, undertake this review, and as the next senior alive of the explorers of 1850–55, the duty has devolved on me. There are still five or six of

us surviving from the 1850–51 expedition, but it is even more extraordinary that in that eminent traveller, and one of the leaders of science, Sir Joseph Hooker, G.C.S.I., F.R.S., there is still a survivor of Sir James Ross's wonderful Antarctic Expedition, 1839–43. As far as the sea part of it was concerned, it was far fuller of hairbreadth escapes than even the *Discovery* met with at sea; but I doubt if the members of any expedition ever had more providential escapes on shore and over glaciers and crevasses than our latest explorers had when sledging. It was said of Sir James Ross that he was nerveless, and I think the same may be said of his successors, judging from Evans's cool expression when rescued from a most perilous position, 12 feet down a crevasse into which he and Captain Scott had fallen: "Well, I'm blowed!" (vol. 2, pp. 283, 284).

It has been truly said that England was made by its adventurers, who as a rule have lacked the wherewithal; but our merchant princes have always been munificent in finding it, and in fitting the adventurers out in a good cause. Wolstenholme sound and Cape Dudley Digges, Jones's sound, Lancaster sound, Smith sound, and other names at the head of Baffin's bay, are those of eminent London merchants of the seventeenth century. Mr. Booth at a later date, in 1830, fitted out the *Victory* under Captain (afterwards Sir John) Ross, at a cost of £17,000. His name was given to the peninsula of Boothia, at the bottom of Prince Regent inlet, and for the results of that expedition he was made a baronet. The north magnetic pole was discovered by Captain (afterwards Sir James) Ross in the *Victory's* voyage, nephew, and second in command to Sir John Ross. In 1840 he also approximately fixed the position of the south magnetic pole. Grinnel Land was named after a citizen of the United States, who equipped, at his own cost, a small expedition to assist in the search for Franklin. In recent times we have Newnes, Harmsworth, and others fitting out exploring expeditions, and the *Discovery* is no exception. Mr. Longstaff gave £25,000 towards the *Discovery* fund, and as Captain Scott justly observes, "When the *Discovery* sailed, it was to act on a concerted plan between expeditions of various nationalities. It is certain that Great Britain would not have been represented in this exploring effort had it not been for Mr. Longstaff's munificent gift. But whilst our countrymen complacently reflect that the British tradition for exploration has been maintained, they appear entirely to have forgotten the man who made it possible." He also gave £5000 towards fitting out the relief ship *Morning* in the following year, as did also Mr. Edgar Speyer. The fund collected by subscription eventually rose to the amount required, and with £92,000 in hand, the financial question was settled, and the work of equipment proceeded with. Never was money better spent, never was a better result obtained, and never was there a more readable account of work performed than is given in these volumes. Every effort was made to obtain, not only the fittest men for the work, but, as far as was possible, those who would agree with one another—a very important point. They lived, as Scott mentions, in the greatest harmony for three years. These efforts were successful. I saw much of the members of the *Discovery* Expedition when they were being *fêted* after their return. The only difference of opinion I heard was as to whether the emperor penguin or the smaller species were the best eating, and very fortunate it was that penguins and seals were so plentiful as to neutralize some of the preserved provisions that were more than suspected of being the cause of attacks of scurvy which occurred. We will briefly pass over the fitting out, except to mention that their Majesties the King and Queen honoured the *Discovery* at Cowes with a visit just before sailing on their glorious mission, which, it is almost unnecessary to say, was highly appreciated.

After a long voyage to New Zealand, they arrived at Port Lyttelton, November

29, 1901, named after the late lord of that name, who took great interest in founding the Church of England settlement of Canterbury, New Zealand. Their reception was of the warmest, from the inhabitants in general and particularly from the merchants, who supplied the expedition with many useful articles gratuitously. Subsequently the New Zealand Government granted £1000 for the relief ship.

Before following them on their perilous voyage, I will take the opportunity of stating the very great advantage this expedition had over those of my day. This advantage was the comparative youthfulness of the leader and of those under him. It was the belief of all of us, then the rising generation of 1850, that polar exploration was essentially the work of young men in full possession of their physical powers, with, of course, a fair amount of knowledge of various sciences. The leader should not be above forty years of age, and thirty-five would, as a rule, be better, except in a very few exceptional cases. To that doctrine I have always adhered, and it was carried out most strictly by Sir C. Markham, who had also always been of the same opinion. In the earlier Arctic voyages, 1818 to 1840, all the leaders were young—Parry, Franklin, both lieutenants, Richardson, a young surgeon R.N., and Back, a mate. They were all about thirty when selected for commands, and those under them were, of course, younger. The traditions of the value of youth, derived from the great war, had not departed from the Admiralty of that day, as it had a quarter of a century later, when only captains, and generally senior ones, were appointed to these commands. Even Franklin had forgotten it when the First Lord of the Admiralty objected to his sixty years of age, stating he was only fifty-nine. One of the last things we learn is the knowledge that we are growing old physically. There was much truth in our old ice-quartermaster's observation in 1850 respecting the United States expedition under Lieut. De Haven and his youthful officers, "There they goes; they knows nothing, and fears nothing." The latter quality of fearing nothing is of more value in icy exploration than the caution derived from experience of a long-past date. The most experienced whaling captain cannot foresee the rapid changes in ice-movements. So inexperience is not as heavily handicapped in the ice as elsewhere. The power of instant decision is what is required. In further support of my belief as to youth, Sir William Hewitt told me that Sir W. Meuds, flag-captain to Admiral Sir Edmund Lyons during the Crimean war, said to him, "We old heads can plan, but it is for you young men to execute."

In a brief article such as this must necessarily be, the passage from New Zealand, which was left on Christmas Eve, 1901, to the great Antarctic continent may be briefly summarized in the heading to chapter iv., vol. 1—

> "In fog and heavy weather,
> Through 'wildering sleet and snow,
> We fought the ice together
> On a track where no ships go."
>
> *Anon.*

January 4 the Antarctic circle was crossed, and the first of the pack seen—through which the explorers forced their way with varying success, as usual in pack-ice, where perseverance is generally rewarded, and they emerged from it on its southward side (see plate, p. 131) on January 8, and at 10.30 p.m. the first sight of the Antarctic continent was enjoyed. So clear was the weather that the peaks of the Admiralty range were visible at 100 geographical miles. The first sight of penguins and seals in the pack, and the first essay in eating them, caused some excitement. Little then did they anticipate how greatly they would be indebted to the same food in the time to come. "The Albatross and various oceanic

petrels" were replaced by the "blue-grey" southern fulmar, the Antarctic petrel, "the pugnacious skua gull," and the "small snowy petrel." At Cape Adare, where Sir George Newnes's expedition, of which Mr. Bernacchi was a member, wintered, the *Discovery* made a brief stay, and the explorers landed. A thousand feet above them was the grave of the only member of that expedition who died—Mr. Hanson, the naturalist. "So there rest the remains of the only human being who has found burial on this great southern continent, and above his body still stands in touching memorial a plain wooden cross." The explorers here commenced their real work, which left them little leisure during the remainder of their Antarctic stay. Most interesting is the account of their passage to the termination to the east of the "Great Ice Barrier." The account of its first being sighted and of its being seen from above in the balloon is most exciting (vol. 1, p. 163). There is a charm in being "the first that ever burst into that silent sea," but a still greater excitement in being the first civilized being that ever stood on any shore. Read! and I am sure there will be but few dissentient to the fact that those moments far more than repaid them for all their toils past, present, and future; and here again we are indebted to poetry for a brief but excellent description—

> "She skirts the icy margin of the main,
> And where, unchanging from the first of time,
> Snow swells on snow amazing to the sky,
> And icy mountains high on icy mountains piled
> Seem to the shivering sailor from afar,
> Shapeless and white, an atmosphere of cloud."
>
> THOMSON. Heading, chap. v. p. 163.

From this date, January 21, a most exciting and interesting period was passed skirting along this "Ice Barrier" till getting into winter quarters, February 9. More especially the ascent in the balloon from the summit of the ice barrier is a most interesting event. The best idea of it will be gained from the plate at p. 198. To Sir Joseph Hooker the expedition was indebted for the idea of the balloon, and special funds had to be raised for it, as it was not in the original programme. The experience gained justified the expense; the allowance of gas, 500 cubic feet, was given to it, but it required another 100 feet in that climate to inflate the balloon properly. The temperature is not given. It was probably 15° to 20° below freezing-point of Fahrenheit. Captain Scott is the first Antarctic aeronaut, and Mr. Shackleton the second. The latter took photographs of the ice from the height to which the balloon raised him.

The winter quarters were only a few miles distant from Mou 's Erebus and Terror, the former being, as in Ross's time, sixty-five years previou .ly, in an active state, and from its summit, 14,000 feet above the sea, a correct idea of the prevailing wind at that height was obtained by watching the smoke issuing from the crater. Had an eruption like that of Vesuvius occurred, future New Zealanders might puzzle as to the remains found under the ashes and lava. As it happened, the winter quarters were in a very good position for the various duties of the expedition—scientific or travelling, etc. From the hardships of the autumn travelling and various mishaps the one want of the expedition—experience—was supplied, in the case of Vince, alas! by the loss of one precious life; nor could the body be discovered after a very active search (vol. 1, p. 233). Fortunately, they were enabled to lay in a good supply of seal and penguins to diversify their diet during the long winter of 128 days without seeing the sun. The sunsets in the autumn of the departing sun, and its twilight after its departure, were equally glorious. Their various methods of passing the time, and the rapidity with which

it passed, judging from my own experience of three Arctic winters, made their Antarctic winter seem to explorers a period which will be regarded by them hereafter "as halcyon days." This will always be the case when there is no lack of diversified occupation, and a keen enthusiasm in preparing for the work of the spring.

A very interesting portion of this book is devoted to the account of the sledge-travelling operations, which were of a different nature from those of the naval Arctic expeditions. The only land we travelled over was Melville island, which was at first harder work than any ice-travelling, owing to the quantity of ground bare of snow over which sledges could not be dragged. They had to be unloaded, and portages made, as Scott had to do when his dogs broke down; but, as knowledge is power, the week of crossing Melville island was reduced to 2½ days on the return by the fortunate discovery of a ravine and a route with very little ground clear of snow. Scott, in a similar way, profited by Armitage's experience of a 27-day route, which Scott reduced to 6. There can never be any comparison of the work done by various expeditions under very different circumstances, and "to make marching records," as Scott observes, is not our work. I very much doubt, however, if Scott's marches, with his small means, will ever be beaten. His southern journey is a splendid example of what can be done by three officers, one of whom broke down from scurvy on the return journey when three weeks from the ship. Captain Scott and Dr. Wilson, the other two members of the party, were also suffering from that debilitating complaint to a lesser extent, and when nearing the ship, Scott observes, "on every side we have suggestions of home. That it is none too soon is evident. We are as nearly spent as three persons can well be." They were 93 days away, and did 960 statute miles; and I have no hesitation in saying that had the party consisted of six men and no dogs, it would have achieved far greater results. If others do not concur with me, all will agree in the wind-up of chaps. i. and ii., vol. 2. "If we had not achieved such great results as at one time we had hoped for, we knew at least we had striven and endured with all our might," and the same might be said of each and every one in the *Discovery*. Each and all realized (as Farragut said of his second in command in one of his battles) the spirit of one of Collingwood's best sayings, "not to be afraid of doing too much. Those who are seldom do as much as they ought." In the second travelling season Scott was away 59 days at a time, 9 being spent in their tents, confined by blizzards and snowstorms, and the distance acccomplished was 725 miles, an average of 14·5 each marching day at an altitude of 9000 feet, the highest ever attained in Polar Regions. In this journey they had several hair-breadth and providential escapes. Captain Scott remarks that, "Taking the 81 days of absence on sledging, I found that Evans, Lashly [his two companions], and I had covered 1098 miles, at an average of 15·4 per day [statute miles], or 13·6 geographical miles.

In this journey the party had, as already mentioned, some wonderful escapes, accounts of which would be too long to give here. In one, however, when tramping along merrily, Scott and Evans stepped on nothing and disappeared from Lashly's view down a crevasse. Fortunately, they were rescued from this peril. When Scott got to the surface, Lashly said, "Thank God!" and when Evans was rescued, he said, "Well, I'm blowed!" "the first sign of astonishment he had shown." But astonishment was afterwards expressed, "Well, sir, what about that snow bridge?" "If so and so had not happened, where should we be now?" "My word, but it was a close call!" This miraculous escape did not appear to have affected their nerves.

The two volumes are a mine of wealth to future Hentys, Stevensons, and other

writers for boys. Captain Scott may well wind up the travelling results in the following words: "We may claim, therefore, to have accomplished a creditable" [far too mild an expression] "journey under the hardest conditions on record," and he adds the hope that his future wanderings will never again lead him to the summit of Victoria Land" [at a height of 9000 feet]. It is curious that the skeleton of a seal was found 5000 feet above sea-level, and another was found lower down. It is also worthy of remark that the Antarctic seal and the penguin feel in much greater security on the ice than in the water, and consequently there was no difficulty in killing them. In the Arctic Regions the reverse is the case. A seal on the ice is quite on the alert, for there he is at the mercy of the prowling bear if surprised, while in the water he is secure from the bear or any sea monster. It requires very skilful hunting to catch him asleep on the floe in the Arctic seas.

Captain Scott, on his return, found the sledging resources of the ship had been utilized to the fullest extent, "and parties had been constantly going, ever adding something to the knowledge of our surroundings," mostly for scientific purposes. Lieut. Armitage occupied 52 days, and, at great risk and danger, was the first to ascend to the central plateau to a height of 9000 feet above the sea. The party were 37 days on the outward trip to ascend this height, but only 15 returning. One accident occurred to Armitage, who reports, "We descended the upper fall with ease, and while crossing the smooth ice at their feet . . . I suddenly became conscious I was taking a dive; then I felt a violent blow on my right side, and all the breath seemed to be shaken out of my body. Instinctively I thrust out my knees and elbows, and then I saw I was some little way down a crevasse. It was about 4 feet wide where I was, but broadened out to the right and left of me; below it widened into a huge fathomless cavern. Skelton sang out that my harness had held, and threw down the alpine rope with a bowline in it. I slipped this over my shoulders, and was hauled up with a series of jerks and landed on the surface, feeling rather as though I had been cut in two, with not a gasp left in me. I was let down about 12 feet." This was almost as marvellous an escape as that already mentioned of Captain Scott and Evans. The result of this journey was very useful to Captain Scott in his western journey on the upper plateau next year, when he also attained 9000 feet above sea-level; it enabled him, by trying a different route, to reach the point of starting for his plateau 27 days to 66. These western journeys proved, as far as they went, that the upper plateau of Victoria Land was a fairly level plateau 9000 feet above the sea. There were other comparatively long journeys. Lieut. Royds and Mr. Bernacchi made a journey of 260 miles over the continuation to the south of the "Icy Barrier," which occupied 30 days, and proved the ice over which he travelled was a plain, as did Captain Scott in his southern journey. Mr. Bernacchi on this journey made a valuable series of magnetic observations. Lieut. Barne also did very excellent work during the exploration, in laying out a depôt for Captain Scott's long journey, and, with Lieut. Mulock, did valuable work in surveying the coast up to 80° S. lat., encountering many difficulties.

The table on the chart shows the extent and duration of travelling done by each party. Those of the scientific department were more for scientific researches into the structure of the land glaciers, etc., than for geographical discovery.

Some of the remarks of the men are amusing. Lashly observed, on seeing mud at the foot of a glacier, "What a splendid place for growing spuds!"

Amongst other curiosities, Dr. Wilson found "calcareous growth in seals' hearts, and concluded they suffered from gout." The Primus cooking apparatus was a great improvement on ours, enabling them to have hot lunches, instead of cold, as we had, and their afternoon marches were the longest. Experience taught us six

hours before lunch and four after it were the best. The sledgeometer was a great check on overrating distances so common in Arctic travelling. These volumes are not only instructive, but most interesting, which is not the case with all works of travel.

Scott observes, "On the whole the displays of the Aurora Australis have been disappointing. We had expected them to be more brilliant." In returning from the Arctic Regions, the displays of the Aurora Borealis were much finer when crossing the Atlantic in lat. 60° to 56° N., and were much more brilliant than at our winter quarters in lat. 74° N. The finest one I ever saw was at the mouth of the Humber, our first anchorage in returning in September, 1851. I forget the exact date. There it was, a circle of rose-coloured light, and two columns. In London it was so vivid the fire-engines were on the move while it lasted during the night.

With more time and space, there are other points which might be touched on. It is evident some of the food was not as satisfactory as it ought to have been, as is shown by one of the witticisms of a nigger minstrel, who, in reply to "Which is the quickest way to clear the lower deck of the *Discovery*?" said, "You take and open a tin of ——'s Brussels sprouts."

The condition of food bought in New Zealand, etc., was more satisfactory than some of that brought from England. The food of travelling parties, and the semi-starvation and scurvy in them, appear to require scientific investigation.

There cannot be a better wind-up to this article than by calling attention to the admirable work of the relief ship *Morning*, under her very able commander Colbeck.

R. Vesey Hamilton.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Routes and Social Types.

'Les Grandes Routes des Peuples, Essai de Géographie Sociale. Comment la route crée le type social.' By Edmond Demolins. 2 vols. (i. Les Routes de l'Antiquité; ii. Les Routes du Monde Moderne). **Paris: Firmin Didot. 1903.**

These two interesting and suggestive volumes are devoted to an exposition of a remarkable theory, "La cause première et décisive de la diversité des peuples et de la diversité des races, c'est la route que les peuples ont suivie. C'est la route qui crée la race et qui crée le type social." The routes followed by the great races of mankind, in the author's view, have acted like powerful alembics, transforming human nature with the same inevitableness as certain metals are transformed by chemical agency. Insensibly, unavoidably, the routes of the steppes, of the tundras, of the savannas, of the tropical forests, have worked out the types of Tartar-Mongol, of Lapp-Esquimaux, of Red Skin, of Indian, or of Negro humanity. Everywhere the route, the line of march followed in racial migration, has imprinted upon mankind its own mark, with fatal and rigorous exactitude. The diversity of these routes alone explains the diversity of Western nations and what is commonly called the distinctions of national genius. If the routes change, the nation changes, the race alters: everywhere the same routes reproduce the same social types, and impose on those who follow them the same essential characteristics. From this conception, M. Demolins believes, geography and history acquire fresh value: the former now begins to explain the nature and social functions of the various great routes, and consequently the origin of the various great races of mankind; the latter rises to the position of the highest and most exact philosophy, showing us how natural conditions are fulfilled in time.

Essentially, the present study is an essay in social science viewed from a number of historical and geographical standpoints, and it is to social science journals that its proper discussion must be referred. But it may be said, that even if we think the author prone at times to bend facts of history and geography to his purpose, and even if we regard his theory as failing to explain a very large part of the field which he surveys, yet in these volumes we must recognize material and treatment of a highly stimulating character, not least suggestive where one most strongly disagrees with the conclusions.

C. R. B.

Travels of Rabbi Benjamin.

'Die Reisebeschreibungen des R. Benjamin von Toledo von Dr. L Grünhut und Markus N. Adler.' Jerusalem (Frankfurt a. M.): 1903.

This edition of the great Jewish traveller of the twelfth century, comprising the Hebrew text, with notes (Part i. pp. 1–164), a German version of the revised original (Part ii. pp. 1–96), an introduction of twenty-four pages, and two sketch-maps (i. of Syria and Palestine; ii. of the "lands of exile," viz. Mesopotamia and Western Persia), both of somewhat inadequate character, claims to have been prepared from a fresh examination of three manuscripts of the thirteenth and fourteenth centuries, and to be no mere reissue of Asher. This claim appears well substantiated: Dr. Grünhut and his colleague have certainly produced a conscientious and serviceable work, especially in its critical parts; their commentary on the subject-matter is of slenderer character, and cannot pretend for a moment to supersede Asher's, or to give us more than a certain number of addenda and corrigenda to the edition of 1840–1. Even here, however, the student will find some useful hints, especially for the identification of personal and place-names in the narrative. In the Introduction an account is given of some of the chief manuscripts and editions; various criticisms of Rabbi Benjamin, especially those coming from R. Jacob Saphir, are considered and refuted; and particular attention is given to the questions of the date, purpose, and exact course, of Benjamin's journey. The number of missprints, omissions, and other matters corrected by errata and additamenta, is unfortunately large (Part ii. pp. 97–99), and the index is, still more unfortunately, small, even to the vanishing point.

C. R. B.

THE MONTHLY RECORD.

EUROPE.

The Island of Ictis.—Mr. Clement Reid, of the Geological Survey, lately read a paper before the Society of Antiquaries on the subject of the island of Ictis (or Mictis), referred to by Timæus, Diodorus Siculus, and Pliny in connection with the ancient tin trade with Britain, the identification of which, in a way that would harmonize with the statements of the writers in question, has always been a matter of some difficulty. The paper has been printed in *Archæologia* (vol. 59, 1905), and also issued separately as a reprint. Mr. Reid approaches the question with unusual qualifications for its solution, as much depends on a correct knowledge of the physical changes which have taken place on the south coast of Great Britain since the beginning of our era. An obvious interpretation is that which identifies Ictis with Vectis, the name of the Isle of Wight in Roman times. But in this case the difficulty has been to explain the statement by Diodorus

Siculus that the tin was carried in waggons from the mainland to the island by a passage which was dry at ebb-tide, though covered at the flood. This historian considers this a general characteristic of the islands between Europe and Britain, but while this would seem to be an incorrect generalization, Mr. Reid thinks that the author was quite right as regards the only island on the trade route described, which in his view really was the Isle of Wight. He points out that the strata east of Yarmouth form a basin or syncline, at the bottom of which lies the Bembridge limestone, a rock which can form extensive pavement-like ledges on the foreshore. The basin is now incomplete, having been cut away in the west by the Solent; but it was evidently once continuous, and if the geological map be completed so as to show the state of things at a time when the limestone still rose to sea-level throughout, it is found that the loop of rocky ledges must have reached the mainland coast of 2000 years ago, this having since receded a considerable distance through the action of the sea. A sketch-map is given showing the probable contours of the coast about 100 B.C., with the band of hard limestone connecting the island with the mainland and forming a causeway such as is hinted at by Diodorus Siculus. Everywhere else the bottom would be soft clay or loose sand, making it impossible to take carts across even were the water shoal enough. To meet the objection that the ancient valley of the Solent (which in late Pliocene times had as headstreams the modern Frome and Avon) must have isolated the Isle of Wight long before Roman times, Mr. Reid points out that after the inroads of the sea first cut off the headstreams of this river system, a divide would gradually be formed towards the east across the modern Solent, and that its position would be determined by the same belt of hard limestone which, after the level of the valleys had been further lowered, became the causeway used in the tin trade.

The Scottish Peat Mosses.—An interesting study of some of the Scottish peat mosses has been carried out by Mr. F. J. Lewis, of Liverpool University, who is already known to readers of the *Journal* for his researches on the botanical geography of the north of England (vol. **23**, p. 313; vol. **24**, p. 267). The results of the first part of his work, which was concerned with the mosses of the southern uplands of Scotland, have been described by Mr. Lewis in the *Transactions of the Royal Society of Edinburgh* (vol. **41**, part iii., 1905). The special value of the investigation lies in the care bestowed on the elucidation of the *succession* of plant remains in the mosses, a knowledge of which is more likely to throw light on problems of geological history than the mere record of plants occurring over wide areas. The data were obtained both by borings and sections, the former made with a 2½-inch clay auger with rods to bore to 20 feet; the latter generally in the form of a pit varying in length from 8 to 16 feet, according to the depth to be reached (16 to 17 feet in some cases). The areas examined in 1904 were: (1) The upland mosses between the Merrick and Kells ranges in Kirkcudbright and Ayr; (2) upland mosses in the Tweedsmuir district in Selkirk; (3) hilltop peat of the Moorfoot hills in Peebles and Edinburgh; (4) lowland mosses in Wigton; (5) buried peat in the Earn valley; (6) mosses resting on the 25-feet raised beach of the south coast. The sections obtained in each of these are described in detail, the general conclusions being as follows. The peat in all the districts shows a definite stratification of plant-remains, indicating a swing from woodland to heath and moss, and again to woodland. Such alternations cannot have been due, in the hill districts under discussion, to mere changes in drainage caused by the throwing up of a clay or sand bank (suggested by Dr. Gunnar Andersson as the determining factor in the case of areas in Sweden), but seem the result of climatic changes extending over wide areas. The sections shown by the Merrick and Kells

mosses, and by those in the Tweedsmuir district, are in very close agreement. They occur above and upon the moraines of the local ice-sheets and glaciers of the southern uplands (belonging to the "third" epoch of glaciation), and must therefore be of later date; while the presence at their base of woodland (*Betula*, etc., found at the base of all the Scottish mosses examined) suggests that they did not originate until a temperate climate had replaced the glacial conditions. A return to colder conditions, severe enough to cause considerable glaciation in the highlands, is indicated in both districts by a bed of Arctic plants (*Empetrum* with *Salix herbacea* and *reticulata*). This would seem to represent the "fourth" glacial period—that of the mountain valley glaciers, when the snow-line stood at 2500 feet. Higher up again there is a well-defined woodland bed, defined by *Pinus sylvestris* in the one district, and by *Betula alba* in the other, but this dies out upwards, apparently indicating a return to colder and wetter conditions, marked by the growth of *Sphagnum*—the typical plant in the bulk of the sections. In the Moorfoot hills there are widespread forest beds, and no decidedly Arctic vegetation, though a colder period may be indicated by a zone of *Empetrum* with *Arctostaphylos*. The lowland mosses of Wigtonshire occupy large badly drained hollows in the till, and seem the only ones in which peat is forming at the present day. Lastly, the mosses lying on the 25-feet raised beaches contain no Arctic plants, but their vegetation agrees generally with that in the *upper* layers of the older mosses inland.

Roman Itineraries in France.—An article by M. A. Blarquez on the "Roman Roads in France" appears in the *Comptes Rendus* of the National Congress of French Geographical Societies (Session XXIV., 1903: Rouen, 1904). The writer shows how the length of the Roman mile differed in different parts of the empire. The following itinerary from Reims to Metz by way of Verdun is first cited:—

"A Durocorturo Divodurum—

Usque	mpm.	LXII.
Basilia	"	X.
Axuenna	"	XII.
Virodunum	"	XVII.
Fines	"	IX.
Ibliodurum	"	VI.
Divodurum	"	VIII."

Now the actual distances from Durocorturum (Reims) to Axuenna (Aisne) is 55 kilom.; thence to Virodunum (Verdun), 42 kilom.; thence to Divodurum (Metz) 58; altogether 155 kilom. If, then, we divide the respective numbers of kilometres by the corresponding numbers in the above itinerary, the result in all cases closely approximates to 2500 metres, or 1·55 English miles, which gives us the length of the Roman mile. The next itinerary cited is from Reims to Metz by way of Tullum (Toul):—

"Usque	mpm.	LXXXVI.
Fanum Minervæ	"	XIV.
Ariola	"	XVI.
Caturigas	"	IX.
Tullum	"	XVI.
Scarpona	"	X.
Divodurum	"	XII."

The site of Fanum Minervæ is, in the author's opinion, a hill 2 kilom. to the north of Dampierre-du-Temple. Ariola the author would not place at Vroil, but

not far from it in the environs of the Viere river. From this second table, too, by a process similar to the above, the Roman mile again works out at 2500 metres, or 1·55 English mile. In other itineraries, however, the mile is found to be sometimes 1666 metres (5466 feet) long. The following are the conclusions at which the author arrives: (1) Some Roman roads in the itinerary have for unit of measurement a league of 2500 metres; (2) in others the distance is expressed in miles of 1666 metres, the mile and a half in such cases corresponding to the league; (3) there are roads the distances on which are expressed sometimes in miles, sometimes in leagues; (4) there are roads the distances on which are measured sometimes by leagues of 2222 metres (the Italian mile and a half), sometimes by leagues of 2500 metres; (5) on the road from Frejus (?) to Arles some distances seem to have been measured by miles approximately 1300 metres long. The article is marred by a number of misprints, which sometimes render the identification of the place-names a matter of difficulty.

Ancient Navigation of the Garonne.—The *Comptes Rendus* of the Congress of French Geographical Societies in 1903 (Rouen, 1904) contain an article of much interest by M. Guénot, on the navigation of the Garonne. So feeble, owing to the results of deforestation, is now the current of the Garonne between Toulouse and Agen, that many would discredit the notion of its ever having been navigated by merchant craft. Yet before the Roman conquest of Gaul the Garonne was much thronged by Gaulish boats. The site of Toulouse was chosen for the sake of navigation. The centre of a great pottery industry, the floor of the ancient town, a few yards underground, is strewn with amphoræ, broken and whole. Thanks to the river, the *Figlinæ* had dealings throughout the greater part of the country between the two seas. The amphora was used as a unit of measure. A boat was of 200, 500, 1000 amphoræ. At Tolosa four deniers per amphora was imposed on merchants in the year of Rome 678. The Garonne was the principal part of a brisk commercial route from Rome to Arles, Narbonne, and Bordeaux. At Toulouse merchandise was transferred from land to water carriage, and *vice-versâ.* By the rivers were carried wood, marble, and the stone of the Pyrenees for the construction of cities and Gallo-Roman villas. Narbonne and all the riparian towns had ports, and these, again, had merchant companies, and among such companies there was a comprehensive union. There were separate unions of *Scapharii* and *Tricularii.* Strabo testifies how "the rivers of Gaul offered and still offer convenient routes of traffic, for, thanks to the favour of Nature, such is their correspondence that, after a short land journey, people pass to and fro from sea to sea by water." No less interesting is the history of the part played by the Garonne in the commerce of Europe, and ultimately the whole known world from the time of the invasion of the barbarians down into the eighteenth century. In one voyage in 1268 the monks of Granada transported 40 tons of wheat, 120 tons of wine, 8 hogsheads of salt, 21 cwts. of copper and tin, wood, cloth, and lead. On the return voyage they brought 6000 herrings and 2000 cod. The boats rowed down and towed up. The article includes curious and illustrative citations from letters patent of Henry II., contracts, and other documents.

The Temple of Serapis.—It is stated in the *Rivista Geografica Italiana* for October last (p. 497) that a connection of the Temple of Serapis near Pozzuoli with the general network of the Italian precise levelling, was carried out last summer by the Istituto Geografico Militare. This will afford the means of exactly determining the amount of future fluctuations of level at this classical spot.

Exploration in the Northern Urals.—Prof. Duparc, who, with his colleague Prof. Pearce (both of Geneva University), has lately continued his fruitful researches into the physical geography and geology of the Urals, has communicated

to the November number of *La Géographie* a short note on the results of last summer's journey. He remarks that, if the vegetation of the Northern Urals be left out of view, and the lighting and tones modified somewhat, one may well imagine one's self in some Colorado landscape. It is surprising, he says, that this analogy has escaped the few Russian travellers who have visited the region, and have found there indications of glacial phenomena, which in reality do not exist. The journey, which was particularly instructive, led past the sources of the Vichera (which were carefully examined) into the basin of the Pechora, where, however, the sudden approach of cold weather prevented further work. The data collected will permit of the preparation of a map of the whole region of the Vichera, Sosva, Vagran, Kakva, and Kosva rivers, while Prof. Duparc also promises a general sketch of the geophysical and geographical features of the Northern Urals.

ASIA.

French Expeditions in Eastern and Central Asia.—News has been received in France of the death of Lieut. Grillières, a French traveller of much promise who became known some two years ago for an enterprising journey on the borders of Yunnan and Tibet. He had lately started on a new expedition towards the same region, and had successfully passed through northern Siam and the Shan States *en route* for Yunnan-fu, when he succumbed to an attack of fever at Semao. Another French traveller, Mr. Comby, has made his way to Yunnan by way of the Red river, paying attention to the ethnography of the regions traversed, and making natural history collections. A still more extensive journey is planned by M. Pelliot, who is about to start for Central Asia under the auspices of the *Académie des Inscriptions et Belles Lettres*, of the Minister of Public Instruction, and of the Paris Geographical Society. Its objects will be primarily archæological, and it is proposed to traverse Chinese Turkestan and Northern Tibet in a generally west-and-east direction, finishing the journey at Peking at the end of some two years. M. Pelliot is professor of Chinese at the Ecole Française d'Etrême-Orient at Hanoi, and his linguistic competence should stand him in good stead in the researches he hopes to carry out. They will be directed, according to the *Bulletin du Comité de l'Asie Française* (October, 1905), principally to an examination of the ruins, and particularly the inscriptions, dating from the period when Chinese Turkestan was subject to Turco-Buddhist dynasties, during the early centuries of our era. This paper states that M. Pelliot is going out under the auspices of the French branch of an International Association founded in Russia for the exploration of Central Asia and the Far East, while the supporting bodies are given as above in the November number of *La Géographie.*

Journey across Southern Borneo.—It is stated in the *Deutsche Kolonialzeitung* for October 7 last that a crossing of Southern Borneo from Banjermassin to Pontianah, through the primeval forests of the centre of the island, has been effected by Lieut. Messemaekers van der Graaf, with a force of a hundred men. Two months were taken on the journey.

AFRICA.

M. Villatte's Journey in the Central Sahara.—M. Villatte's account of his journey from Tidikelt to Adrar and back, in company with Colonel Laperrine (*La Géographie*, October, 1905), to which reference was made in the December number, supplies a detailed description of the country along the routes followed, with much information on the geological structure, conditions of vegetation and

climate, and other features, which is particularly acceptable by reason of the indefinite nature of our previous knowledge of this part of the desert. Although traversed in parts by Major Laing in 1826, it had never since been crossed by a European expedition, while the loss of Major Laing's journal after his murder near Timbuktu robbed us of the geographical information that might otherwise have resulted from his journey. The expedition set out from Akabli, south-west of Insalah, on March 14, 1904, and the route led in a generally southern direction to the mountainous region of Adrar in about 20° N. It crossed various expanses of "reg," or hard stony plains, with occasional stretches of dunes, as well as some more elevated plateaux, while mountain *massifs* of some importance were seen on either side of the route, including the Adrar Ahenet to the east. The geological formation was for some distance a sandstone of Devonian age (as shown by the fossils found in several localities), which formed an extensive plateau some 600 to 1000 feet higher than the "reg." Pasturage and other vegetation were occasionally seen in some luxuriance, and no difficulty seems to have been experienced in the matter of water-supply. At Inzize the watering-place is a pool difficult of access, as it occupies a crater-like depression shut in by rhyolite cliffs 500 to 600 feet high. The Devonian plateau had been left behind at about 24° 30′ N. (though traces of the same formation are occasionally seen to the south of this), and the geological formation was thenceforth Archæan. The route entered the barren gravel desert of the Tanezruft, a term which has acquired among the Arabs a more or less generic significance, denoting any level tract devoid of vegetation. The great Tanezruft here mentioned itself consists of three parts, a more broken country to the north and south being included under the same general designation with the true gravel desert between Takhamalt and Timissao. On reaching northern Adrar a complete transformation takes place, the vegetation becoming more luxuriant and the fauna more rich, while a change in the climatic conditions is very apparent. Both here and during the return journey an overcast condition of the sky prevailed, accompanied by a humid atmosphere and violent storms of wind and rain at irregular intervals. Coupled with the heat, the humidity proved very trying. After meeting the detachment from Timbuktu under Captain Théveniaut, Colonel Laperrine's force set out on the return march by a more easterly route, the general features of which are thus summarized by M. Villatte. The region of Tin Ghaor forms a triangle between the Hoggar, Adrar, and Air. Its surface is fairly broken, and bears, among other elevations, a Devonian plateau, the Tassili Tin Ghaor. The way afterwards drops into a "Tanezruft," which continues as far as Tinef, where the mountainous tract of the Tahalghar, between the Wed Abalessa and the Hoggar, begins. The expedition skirted the western outliers of the great Hoggar *massif*, and afterwards passed along the foot of the Tifedest, another elevated *massif* further north. Throughout this part of the journey numerous weds, descending from the eastern highlands, were crossed, and cultivation of wheat, barley, and vegetables was noticed at several places. The principal settlement on this route is Abalessa, just south of 23°. Besides the formations above alluded to, volcanic masses were frequently seen superimposed on the Archæan peneplain. M. Vilatte's map is based on careful astronomical observations, and will form a valuable basis for the future cartography of this region.

Return of M. Gautier.—M. Gautier, whose successful journey across the Sahara was recorded in the December number of the *Journal*, has now returned to France, and further details respecting his route have been communicated to the Paris Geographical Society (*La Géographie*, November 15, 1905). M. Gautier left Taurirt, in southern Tuat, in company with Lieut. Mussel and M. Chudeau, the former of whom was commissioned to survey the hitherto untraversed route to

the south *viâ* Wallen. The small party traversed the *massif* of Asejra, which had previously been seen from a distance only, and then made its way to the Adrar Ahnet, where it was joined by M. Etiennot and his escort under Captain Dinaux. After a halt for the purpose of getting the camels into condition for the passage of the Tanezruft, the march was resumed by way of Inzize and Timissao (also on Colonel Laperrine's and M. Villattes's route of the previous year) to the "Adrar of the Iforas." Here the other Europeans turned northwards, while M. Gautier proceeded to Gao on the Niger under native escort only. M. Chudeau was, meanwhile, to explore the Hoggar *massif*, and thence proceed to Air and Zinder, whither it is expected that he has already arrived. M. Gautier lays stress on the ease with which peaceable travellers can now traverse the Sahara in all directions.

Geographical Work in French Africa.—The November number of *La Géographie* refers to several pieces of work which will add to our knowledge of the geography of the French African territories. On the lower Senegal, surveys have been carried out on a geodetic basis with a view to supplying a more accurate map than has hitherto been in existence, and of this the first two sheets have already been issued. This is only part of a general scheme for the survey and mapping of the French West African territories, to be proceeded with as opportunity offers. Maps have also been prepared giving the results of the expedition of M. Chevalier to the south-east of Lake Chad. They are the work of M. Courtet, a member of the expedition, and pay special attention to the economic possibilities of the region, the distribution of modes of cultivation being carefully marked. The same number contains an important paper, by Lieut. Audoin, on the hydrography of Lake Chad, which will be noticed at length in a subsequent number of the *Journal*. The French boundary with the Kamerun is at last to be delimited on the spot, the work on the eastern and southern frontiers being entrusted to two distinct commissions, which have already started for the West Coast. The French sections are under the charge of Commandant Moll and Captain Cottes respectively. An outline is also given of survey and other work accomplished in Madagascar in 1904, based on a recent report of General Gallieni.

Mr. W. A. Cunnington's Expedition to Lake Tanganyika.—We have received from Prof. Ray Lancaster the report of the third expedition for biological research despatched to Central Africa under the auspices of the Tanganyika Exploration Committee. As has already been mentioned in the *Journal*, the expedition was placed in charge of Mr. W. A. Cunnington of Cambridge, who left London on March 24, 1904, and returned in June, 1905. The time spent on and around Tanganyika was about eight months, during which time the collection of the fauna and flora of the lake was vigorously prosecuted, as well as observations of temperature and of alterations in water-level. The former seems in general very high, the lowest obtained being 73°·3 Fahr., the highest 81°. At a depth of 76 fathoms (the length of the sounding-line) the temperature appears fairly constant, all the readings varying only between 74°·1 and 74°·8. The return route adopted was by the Victoria Nyanza (on which lake collections, including a species of prawn and a sponge, were also made), Uganda, and Zanzibar. Between Tanganyika and Bukoba, on the Victoria lake, progress was delayed by bad weather and by the famine-stricken nature of the country traversed. The report does not discuss the conclusions relative to the past history of Tanganyika arrived at by Mr. Cunnington, but we understand that they are opposed to the views of Mr. J. E. S. Moore.

Captain Lemaire's Surveys in the Lado Region.—The well-known Belgian explorer, Captain Lemaire, has returned to Europe after a three years'

absence, during which he has carried out important surveys and geographica studies in the extreme north-east of the Congo State, principally in the Lado enclave. The return journey was made *viâ* the Nile.

The Sebu River, Morocco.—We learn from the *Dépêche Coloniale* for November 11 last, that a French expedition under Dr. Samné has lately made a careful examination of the Sebu river with a view to its capabilities for navigation. The result is said to have been very satisfactory, it having been proved that the river is navigable for shallow-draught boats for a distance of some 125 miles from its mouth, and that, except at very low water, navigation would be possible as far as Fez. It is thought that the river may become of great importance as a route to the interior, and that towns will spring up in its valley, which is likely to become the granary of Morocco. The possibility of establishing a port at the mouth of the Sebu is discussed by Dr. Samné in the issue of the same paper for November 16, which contains a sketch-map. The writer insists on the great advantages as regards position possessed by Mehdiya, on the left bank of the embouchure, a town which has a history dating back even, it is said, to the time of the Phœnicians. The bar which obstructs the mouth of the river is the only drawback, but this does not seem insuperable. An examination of the Sebu mouth has also been made by Lieut. Dyé, well known for the part which he took in the Marchand expedition across Africa, who has lately carried out hydrographical surveys on the west coast of Morocco.

NORTH AMERICA.

The Sierra Madre of Mexico.—In the *Journal* for August last (p. 218) reference was made to a scientific expedition to the western Sierra Madre, carried out by Dr. E. O. Hovey and Prof. R. T. Hill early in 1905. Dr. Hovey has since sketched the physical features of the region visited, as elucidated by his own and Prof. Hill's observations, in the *Bulletin* of the American Geographical Society for September last. The first part of the journey gave an insight into the origin of the stratified beds of the "mesa" or desert formations of this part of North America, which has given rise to so much discussion, and which is explained by Dr. Hovey thus. Under the influence of the great diurnal changes of temperature on the elevated plateau, the volcanic components crack and disintegrate, the fragments becoming smaller as they descend the slopes, and so coming within the transporting power of the heavy winds which often prevail. The material is rapidly carried into the basins which lie between the numerous old centres of eruption and gradually fills them. Temporary ponds are also formed in the depressions, and act like settling tanks—a term suggested by Prof. Hill—with the result that well-stratified beds originate within the wind-drift areas and between beds showing little or no stratification. This explains the occurrence of some of the lenticular deposits of adobe clay found in the mesas. Most of the streams derived from the copious drainage of the high plateaus of this region either dry up in the desert or flow into lakes without outlet. The Conchos, however, a tributary of the Rio Grande, is slowly working back into the high plateau from the east, while the Yaqui and its branches and other Pacific rivers are cutting into it from the west with greater rapidity. Lake Guzman is one of the largest of the desert lakes, but is subject to active evaporation, and is reported to have entirely dried up in August, 1904. Its principal feeder is the Corralitos or Casas Grandes river, of which the principal headstream is the San Miguel, which has cut itself a narrow deep gorge in a well-dissected plain rising gradually to the cliffs forming the upper and outer cañon, the whole depth being 1800 feet. The principal rocks exposed are rhyolite flows and tuffs, but basalt and andesite also occur. From Casas

Grandes to the Yaqui the rocks are almost exclusively volcanic, with local deposits of sandstone and conglomerates derived directly from the former. The great plateau (about 6500 feet above sea-level) is a constructional plain formed by the upper surface of the rhyolite flows. Much of the drainage is still independent, and none of the water falling on this portion reaches either ocean, though a part has been captured by the San Miguel. The mountains rise only from 1500 to 2500 feet above the mesa, which itself gradually rises to the south, until the almost imperceptible continental divide is reached. The great cañon of the Yaqui, on the Pacific side (long the scene of extensive mining operations), is described as rivalling the Grand Cañon of the Colorado. The river is from 4500 to 5000 feet below the highest points of the rim, and from one point nineteen superimposed flows of lava may be traced. The mesa has here a gentle dip to the east and south, and the smaller streams still preserve a "consequent" course to the south-east, but the Yaqui and others of the principal streams pursue an inverted course to the west. In this direction the dissection of the mesas has proceeded farther, and their tops are less extensive than further east. South of the Yaqui is the V-shaped cañon of the Mayo, where a striking development of a dark blue conglomerate was observed.

Mineral Resources of Alaska.—A recent official report, illustrated by maps and diagrams, on the Alaskan work of the U.S. Geological Survey, gives summary estimates by the surveying parties, fourteen in all, made during last year's summer survey, of the economic mineral resources of various parts of the territory. Topographic reconnaissance surveys (1 : 250,000) were made over some 4000 square miles in the Yukon-Tanana region, and over 1500 square miles in Cook inlet placer district, and a detailed map (1 : 4500) made of 600 miles near Nome. A geological reconnaissance was further made of parts of south-east Alaska; the investigation of Fairbanks and Rampart districts and of Seward peninsula followed up; and other work of scientific importance prosecuted. In accordance, however, with the purpose of the report to serve the clamant interests of miners and prospectors, much the greater part is occupied with placer mines, the main source of the treasure drawn from Alaska. The entire product of Alaskan gold placers in 1904, reckoned on the basis of estimates by the Director of Mints, and exclusive of $3,000,000 from lode mines, amounted to $6,000,000—double the amount of 1899, but only $250,000 over the yield of 1903. The report looks forward to an annual yield from placer mines double the amount of 1904 within the next decade. In south-east Alaska the mineral deposits of Sitka, of Admiralty island, and of a belt on the mainland were examined, and a supplementary study made of the principal ores of the Ketchikan district. The total gold product of south-east Alaska for 1904 is estimated at $275,000, exclusive of $3,000,000 from the Treadwell mines. Its silver production is estimated at $30,000; while, except for small shipments for smelter tests, the copper yield has been *nil*. A full report of a supplementary examination of the coal and oil fields of Controller bay region is now in press. The gold drawn from the Cape Yaktag placers in 1904 is estimated at $10,000 to $15,000. A report on the gold placers of Turnagain arm (Cook inlet) mentions that this is notable for its high tides, beginning with a bore 6 feet high at times, and running in from the inlet at a speed of 5 or 6 miles an hour. Small steamers enter and leave at high water. Coal of a very high grade, such as may soon compete with the Pacific Coast bituminous coals, has been found at Controller bay. The coal product of south-west Alaska down to date is estimated at 10,000 tons.

AUSTRALASIA AND PACIFIC ISLANDS.

Magnetic Survey of the North Pacific Ocean.—In a recent communication to *Terrestrial Magnetism*, Prof. L. A. Bauer gives some account of the inauguration of the magnetic survey of the North Pacific ocean, to which reference was made in the *Geographical Journal* for April, 1905, p. 462. The brig *Galilee*, of San Francisco, a wooden sailing vessel of about 600 tons displacement, has been chartered by the Carnegie Institution of Washington for the work. The scientific staff at present consists of Mr. J. F. Pratt (commander), Dr. J. Hobart Egbert (surgeon and magnetic observer), Mr. J. P. Ault (magnetic observer), and Mr. P. C. Whitney (magnetic observer and watch officer), the sailing master being Captain J. T. Hayes. Early in August magnetic observations were made at various places on the shores of San Francisco bay, and the most suitable place for "swinging ship" by their aid determined; afterwards a short experimental cruise was undertaken as far as San Diego, during which daily magnetic observations were obtained, and various instruments and methods tested. On September 1 the *Galilee* sailed for the Hawaiian and Midway islands, and was expected back at San Francisco about December 1. Early in 1906 the expedition will start on a more extended cruise, embracing the entire circuit of the North Pacific ocean.

POLAR REGIONS.

Amundsen's Arctic Expedition.—The news of this expedition that was printed in the December number* has been quickly followed by a further budget, telling of the fortunes of the party down to the end of last October. At that date the *Gjöa* had for the third time gone into winter quarters, but not until the north-west passage had once more, after a long interval, been virtually accomplished. The expedition had already reached a point on the north coast of America near the mouth of the Mackenzie, when, like the fleet of American whalers at work at the time in that part of the Arctic seas, it was forced, by the unusually early advance of severe weather, to prepare for another winter in the far north. From Herschel island, a little to the west of the Mackenzie, Captain Amundsen made his way by dog-sledge to Eagle, in northern Alaska, whence he telegraphed to Dr. Nansen an outline of his doings since leaving his former quarters on King William Land. Gjöa harbour was left on August 13, it being itself then free from ice, though the narrows between Todd island and Point Richardson remained blocked, apart from a narrow channel just as broad as the ship herself. Beyond this there was open water. On the 14th a halt was made at Kaminglu, an encampment of Eskimo a little east of the narrowest part of Simpson strait, where a last meeting with these people took place, one of their number, a youth seventeen years old, accompanying the voyagers for the purpose of seeing something of European civilization. Proceeding on her voyage, after taking supplies of deer-meat on board, the *Gjöa* passed the same day through the narrows of the strait south of Eta island, the channel to the north having been found impracticable by Lieut. Hansen during a

* P. 675. The account there given of the route followed, which was based on Amundsen's letters as printed in the *Times*, needs correction in one or two particulars. It is evident that, as the previous track had led down Peel sound, the *Gjöa* can hardly have passed "through Bellot strait," but probably skirted its western entrance only. Again, as Gjöa harbour lies on the south-east coast of King William Land, only the eastern portion of Simpson strait can have been traversed during the voyage thither. The sledge expedition of the spring of 1905 must also have been destined for the east, not the west, coast of Victoria Land.

boat journey in the summer of 1904. The bottom, which is very level along the shore of King William Land, becomes rougher near the mainland. Near the narrows a depth of 3 fathoms only was obtained. On the 15th the ship passed through a group of more than a hundred islands and islets crowded in the sea between King William and Victoria Land, which had been surveyed by Lieut. Hansen and Sergeant Ristvedt in the previous spring. The intervening channels are shallow and full of shoals, but the pack-ice to the south made it necessary to pass through some of them. In Victoria strait a large body of ice had to be crossed, but clear water was again reached, and the *Gjöa* passed south of Lind island and entered the strait between Victoria Land and the continent. Soon the explorers were in the tracks of Collinson, who was here in 1852–3. Among the points touched at were Cape Colborn (outside Cambridge bay), Douglas and Lambert islands (between which and the mainland a passage with not less than 7 fathoms was found, close to the latter, after some trouble). The Dolphin and Union strait was clear of ice, and, like Collinson in 1853, the *Gjoa* passed near Clerk island without seeing it. The weather now grew rough, with westerly winds. On the 26th the first ship on this side was sighted—the schooner *Charles Hansen* of San Francisco—and other whalers were soon afterwards met with. After passing Cape Bathurst, the voyagers were forced by ice to turn south towards the shallows near the mouth of the Mackenzie, and, after passing Cape Sabine, were finally brought to a halt at King point (placed by Amundsen in 69° 10′ N., 137° 45′ W.), where it was decided to winter. The gallant explorer is to be congratulated on having accomplished, with the slender means at his disposal, a feat which baffled so many well-equipped expeditions in the last century. And it is interesting to find, as has been pointed out to us by a correspondent, that Amundsen's successful voyage has fully confirmed the views of Parry and McClintock as to the most feasible route. Apart from the work of the main expedition, some valuable results were obtained by Lieut. Hansen, who is said to have surveyed the east coast of Victoria Land up to 72° 10′ N. during his sledge expedition in the spring of 1905. Glenelg bay, the furthest reached by Wyniatt of the *Investigator* in 1851 from the opposite direction, is placed in 72° 47′ N., 110° 35′ W., so that only some 40 miles of this coast would now remain unmapped.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Motion of Glaciers.—We alluded some time ago (*Journal*, vol. 20, p. 534) to the glacier observations inaugurated by Bavarian scientists in the Hintereisferner, in the Ötzthaler Alps of the Tirol, and to the results obtained down to that time. The observations have been continued with much perseverance by Profs. Blümcke and Finsterwalder, who have now obtained data which permit of generalization to a greater extent than was before possible on the facts of glacier motion as brought out by their observations. Such a summary is given by them in the *Sitzungsberichte* of the Munich Academy of Sciences ('Mathemat.-physikal. Klasse,' 1905, Heft 1). The paper begins with some general remarks on the variations in time of the motion of glaciers, which, the writers point out, are of three different types, viz. (1) Variations which extend over a lengthened period, and result in a change in the size of the glacier snout; (2) variations comprised within a few years only, and having no influence on the size of the glacier; (3) seasonal variations. As regards the first, measurements at the Vernagtferner and Gliederferner have shown that an advance of the glacier is preceded by a great increase in its rate of motion, which may already show a decline before the advance has reached its maximum. Variations of the second class sometimes show great irregularity throughout a period in which the glacier may show a constant movement in one

direction. It was, however, the third class of variations with which the writers' observations were principally concerned, and on which they tend to unexpected conclusions. They describe fully their methods of work, which consisted in the boring of holes in the ice, in which wooden posts were inserted for the sake of easy recognition, and at the same time to serve as a measure of "ablation." At first the chief attention was devoted to the region of the glacier snout, but afterwards operations were extended quite up to the region of the *névé*, positions being chosen adjoining former marks set up for purposes of observation. The results of the observations are fully set forth in tables. As regards variations of longer period, it was found that the rate of propagation downwards of a change in velocity may be from 20 to 150 times the actual rate of motion of the ice. In this it differs from the wave due to an increase in volume, being apparently rather of the nature of a pressure wave. As regards the seasonal variations, it was found that the generally accepted idea that the rate is greater in summer than winter is by no means universally correct. In the Hintereisferner, at least, this is the case only in the lowest third of the glacier, while towards the *névé*-fields the winter motion is distinctly the greater. In fact, the ratio between the two was found to change with remarkable regularity from below upwards. The reason, no doubt, is that the most important factor in the upper region is the winter increase in weight; in the lower, the summer diminution of friction.

GENERAL.

Livingstone College.—We have received the annual report of this institution for 1904–5, from which it appears that the college is successfully continuing its good work of affording a training in the laws of hygiene to those about to undertake work in tropical climates. Since its foundation more than twelve months ago 238 students have been at the college for periods of not less than one term, and many owe it to the knowledge so gained that they have been able to preserve their health amid most unwholesome surroundings. The college is not yet quite self-supporting, but were the advantages offered made use of by a somewhat larger number of students this might easily be the case.

Tropical Hygiene.—We learn with regret that the periodical *Climate*, edited by Dr. Harford, which has done so useful a service in disseminating information as to matters connected with tropical hygiene, will cease to appear in future, the number for October last completing at the same time the sixth volume and the whole series. Readers of *Climate* will not, however, be left unprovided for, as an arrangement has been made whereby four issues yearly of the *Journal of Tropical Medicine* (published by Messrs Bale & Danielsson, of 83–91, Great Titchfield-street) will be devoted to the subjects dealt with by the former journal. These numbers may be subscribed for separately, the subscription being 3*s.* per annum. Back volumes of *Climate* are offered by Dr. Harford at reduced prices.

Report of the Eighth International Geographical Congress.—The report of the Congress held last year in the United States has now been issued, and forms a clearly printed large 8vo volume of over a thousand pages. By the courtesy of the United States Congress, the Report was printed at the Government printing office in Washington, and is bound in the style usual in the case of United States official publications. Besides a short sketch of the organization of the Congress, a diary and minutes of its proceedings, and various reports, propositions, and resolutions, the volume contains 148 papers, either in full or in abstract, of the total of 220 presented to the Congress (some by title only). These are illustrated by a considerable number of maps, diagrams, and photographs.

CORRESPONDENCE.

Hungarian Place-names.

PERMIT me to direct attention to the numerous discrepancies between place-names on English maps of Hungary and those which are in official and general use in that country. It is an obvious deduction, as well as a matter of experience, that, in consequence of this, British travellers who consult our maps before going to Hungary are much perplexed and inconvenienced when they arrive there. At the railway stations, and in the railway time-tables, only Hungarian names are used; merchants and private persons, writing to England for goods, use the Hungarian names in their letters. To facilitate intercourse between Britain and America on the one hand, and Hungary on the other, an illustrated paper entitled *Hungary* is published in English at Budapest; in this only Hungarian place-names are used. In our newspaper reports from Hungary, only Hungarian, and not German, Chinese, or other names, are used. Every year now the number of British visitors to Hungary is rapidly increasing. All these considerations make it evident that our maps urgently need correction.

I am pleased to find by correspondence that several of our leading map publishers acknowledge the need of this alteration, and that one or two have promised to make it as early as possible.

An expression of opinion by the Royal Geographical Society, of course, would have much more weight than that of any private person, and might lead to a general alteration in the near future.

Especially do I urge that our school maps should receive early attention, so that the rising generation shall learn only those names which are of any real service either for business or pleasure.

I should like to point out that many of our maps do not indicate the perfect political equality of Hungary and Austria, and that, in consequence, there is much ignorance on this point, even among educated people.

W. H. SHRUBSOLE.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905-1906.

Second Meeting, November 20, 1905.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS.—*Rufus à Barrow; Ashton Charles Allen; Joseph William Brown Arkah; Joseph Albert Arnold; Dr. W. G. G. Arnold, M.A., M.B.; Lieut. Michael Barne, R.N.; Lionel Charles Bastow; Ernest Edward Bird; Major Everard McLeod Blair, R.E.; Maurice B. Blake; Lieut.-Colonel L. John Blenkensop, D.S.O.; Charles Belfield Bone; John Bottomley; Joseph Boxhall, commander s.s. "Morocco;" Rev. J. Cumming Brown; Captain William Henry Bunbury, R.E.; James Frederick Burton; E. A. Chartres; Jefferson Davis Cohn; V. K. Cornish; C. T. Costello, M.B.; Captain Herbert McCally Cowie, R.E.; Major Gilbert Stewart Crawford, R.A.M.C.; Jogindra Nath Das; Hermann Dawson-Gröne; Captain Francis Arthur Dickinson (Duke of Cornwall's Light Infantry); Philip Fraser Dietz; Ernest McLeod Dowson; William Emery; William Exshaw; Thomas George Farmer; Max Farrand; Rev. T. W. Fawthrop; Charles Beresford Fox, M.A.; Charles Friedlander; Kingdon Iregosse Frost; Ronald W.*

Gibbin; *Charles Jasper Glidden*; *Howard Golden*; *Herbert Symonds Goldsmith*; *Walter Armstrong Graham*; *Bernard Hahn*; *Musgrave Robert Hall*; *Rev. William Aidan Newman Hall*; *Frederick William Hayes*; *Sir Augustus Hemming, G.C.M.G.*, *Lieut. E. F. S. Henderson* (*Leicester Regiment*); *John Hennell*; *R. M. Heron*; *Richard Stanley Howlden*; *Charles Francis Hutchison*; *Dr. Theo Bulkeley Hyslop*; *Major-General E. R. James*; *Pestonjee Dinshawj Kahn*; *Captain Robert Keyworth, R.H.A.*; *Captain Charles Trevor Lawrence* (*Hampshire Regiment*); *A. P. Low*; *Alexander Mackay*; *Robert Mackintosh*; *Ronald Macpherson*; *Edmund Marsden*; *Felix Mills*; *William V. Morris*; *Captain W. F. O'Connor, C.I.E., I.A.*, *Captain R. Ommanney, R.E.* (*Topographical Section, General Staff*); *W. St. John Oswell*; *Major W. J. Ottley* (*34th Sikh Pioneers*); *Lieut. Thomas H. Plummer, I.A.*; *Henry G. Ponting*; *J. R. Radford*; *Captain Hugh Bradley Roberts, R.A.*; *Robert R. Rusk*; *Hugh Negus Sandys*; *Captain Yasunosuke Satow*; *Hans Christian Schiern*; *Philip Sheppard*; *Hubert Smiley*; *Howard Smith*; *Sir Herbert de Stern, Bart.*; *Antony R. Stevens*; *Murray Stewart*; *Charles Blades Coverdale Storey*; *G. Cecil Strathairn*; *William Marriott Sutton*; *Robert Stanser Templeton*; *James Jonathan Thomas*; *Lieut.-Colonel A. E. G. Watherston, R.E., C.M.G.*; *Lieut. Arthur John Byng Wavell* (*Royal Welsh Regiment*); *Ernest Weakley*; *Captain Clive Wigram* (*18th Bengal Lancers*); *Captain William Hales Wilkie Young* (*Northumberland Fusiliers*).

Introductory remarks by the President.

The Paper read was :—

"First Exploration of the Hoh-Lumba and Sosbon Glaciers (Himalaya)." By Mrs. Fanny Bullock Workman, F.R.S.G.S.

Third Meeting, December 4, 1905.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS.—*Arthur Barris*; *Alfredo Jesus da Silva Basto*; *Frederick Curtis, F.R.C.S.*; *Arthur John Eveland*; *Robert Stevens Fraser*; *Captain H. R. Headlam* (*York and Lancaster Regt.*); *Edward W. Heusinger*; *Frank Henry Houlder*, *George E. Jacobs-Smith*; *George William Lamplugh, F.R.S.*; *Sydney Lorne*, *Anthony C. Magiaw, M.D.*; *Stanley Dods Mitcheson*; *Major J. Weston Parsons Peters* (*7th Dragoon Guards*); *James Steel*; *Lieut. A. W. Stokes, R.E.*; *William Edwin Wade*; *Lieut. Henry Charles Woods* (*Grenadier Guards*); *B. Minors Woollan*.

The paper read was :—

"Exploration in the Abai Basin, Abyssinia." By H. Weld Blundell, Esq.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = **Academy, Academie, Akademie.**
Abh. = **Abhandlungen.**
Ann. = **Annals, Annales, Annalen.**
B. = **Bulletin, Bollettino, Boletim.**
Col. = Colonies.
Com. = Commerce.
C. R. = **Comptes Rendus.**
E. = **Erdkunde.**
G. = **Geography, Géographie, Geografia.**
Ges. = **Gesellschaft.**
I. = **Institute, Institution.**
Iz. = **Izvestiya.**
J. = **Journal.**
Jb. = **Jahrbuch.**
k u. k. = **kaiserlich und königlich.**
M. = **Mitteilungen.**
Mag. = **Magazine.**
Mem. (**Mém.**) = **Memoirs, Mémoires.**
Met. (**mét.**) = **Meteorological, etc.**
P. = **Proceedings.**
R. = **Royal.**
Rev. (**Riv.**) = **Review, Revue, Rivista.**
S. = **Society, Société, Selskab.**
Sc. = Science(s).
Sitzb. = **Sitzungsbericht.**
T. = **Transactions.**
Ts. = **Tijdschrift, Tidskrift.**
V. = **Verein.**
Verh. = **Verhandlungen.**
W. = **Wissenschaft, and compounds.**
Z. = **Zeitschrift.**
Zap. = **Zapiski.**

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch The size of the *Journal* is 10 × 6½

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *G. Teacher* **3** (1905): 62–70. **Garwood.**
Alpine Lakes, Hanging Valleys, and Corries. By Prof E. J. Garwood.

Alps Glaciology. *G. Teacher* **3** (1905): 49–61. **Penck.**
Glacial Features of the Surface of the Alps. By Dr. Albrecht Penck.

Alps—Simplon. *Jahresb. G.-Ethnog. Ges. Zürich* (1904–5): 71–104. **Rosenmund.**
Ueber die Anlage des Simplontunnels und dessen Absteckung. Von Prof. Dr. M Rosenmund. *With Map and Illustrations.*

Alps—Structure *B.S. Belge Géol.* **19** (1905): *Procès Verbaux* 127–135. **Van de Wiele.**
Les théories nouvelles de la formation des Alpes et l'influence tectonique des affaissements méditerranéens Par C Van de Wiele. *Illustration.*

Austria. *Petermanns M.* **51** (1905): 125–129. **Crammer.**
Einiges über Rückzugserscheinungen des Gletschers der "Uebergossenen Alm" in Salzburg. Von Prof. H. Crammer. *Profile.*

Balkan Peninsula. **Lyde and Mockler-Ferryman.**
A Military Geography of the Balkan Peninsula. By L. W. Lyde and Lieut.-Col. A. F. Mockler-Ferryman. London: A. & C Black, 1905. Size 7½ × 5, pp. x. and 204. *Maps. Price 5s. net. Presented by the Publishers.*

An attempt to outline, for a particular region, the sort of geographical knowledge required for the successful prosecution of military operations. The book contains much that is of interest to the general reader, and is a welcome contribution to a subject that has been too much neglected.

Balkan Peninsula. *Iz. Imp. Russ. G S* **40** (1904): 399–436 **Moshkoff.**
Turkish tribes in the Balkan Peninsula. By B. A. Moshkoff. [In Russian.]

Baltic Sea. **Stenius.**
Conseil Perm. Internat. Explor. Mer; Publ. Circonstance **15** (1904): pp. 7.
Ein Versuch zur Untersuchung der Hydrographischen Veränderungen in der Nördlichen Ostsee sowie im Finnischen und im Bothnischen Meerbusen. Von Sigurd Stenius. *Diagrams.*

On variations in salinity, etc.

Belgium.
La Belgique. [1830–1905.] Institutions, Industrie, Commerce. Bruxelles: J. Goemaere, 1905. Size 10½ × 7, pp. xx. and 870. *Map and Illustrations. Presented by M. le Ministre de l'Industrie et du Travail*

Gives a comprehensive view of modern Belgium, especially from the point of view of industry and commerce.

Belgium. *B.S. Belge Geol* **19** (1905): *Procès Verbaux* 20–41. **Simoens.**
Deuxième note sur la tectonique de la vallée de la Senne. Par G. Simoens. *Illustrations.*

Belgium—Antwerp. **Hertslet.**
Scheme for the Extension of the Port of Antwerp F. O., Miscellaneous, No. 640, 1905. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 12 *Plan.* *Price 7d.*

Bulgaria—Meteorology *Petermanns M.* **51** (1905): 176–180. **Kassner.**
Die Temperaturverteilung in Bulgarien. Von Dr K Kassner. *Maps and Diagram.*

Carpathians. *Abrégé B.S. Hongroise G.* **32** (1904): 46–60. **Czirbusz.**
Das Czárku-Gebirge Von D Géza Czirbusz. (*Földr. Közl.* **32**, 1904: 113–159. *Illustrations.*)

Carpathians. *Abrégé B S. Hongroise G* **32** (1904): 63–71 **Lóczy.**
Ueber die Seen des Retyezát-Gebirges. Von Dr. L. v. Lóczy (*Földr. Közl* **32** (1904). 224–233. *Maps.*)

Carpathians. *Abrégé B.S. Hongroise G.* **32** (1904): 128–132. **Sztankovits**
Die mittlere Höhe der über das Gebirgssystem der Karpaten verlaufenden höchsten Linie. Von E. Sztankovits. (*Földr. Közl* **32** (1904): 349–355 *Map*)

Europe. *Naturw. Wochenschrift* **4** (1905): 593–597. **Penck.**
Das Klima Europas während der Eiszeit. Von Prof. Dr. A. Penck.

Europe—Capitals. **Buschick**
Wanderungen europäischer Hauptstädte. Von R Buschick. (Friedrich Ratzels Gedächtnis, 1904. Pp 3–22.)

Færoes. *Rev. G.* **55** (1905): 311–316. **Vinci**
Les îles Faroe. Par V. Gaudard de Vinci. *With Illustrations.*

France. *Ann. G.* **14** (1905). 236–244. **Margerie.**
La nouvelle carte de France au 50,000^e du Service géographique de l'Armée. Par E. de Margerie. *With Map*

France. *B S G. Com. Bordeaux* **31** (1905) 269–278. **Lestrade**
Garonne, Gironde Par P. Lestrade.
Contests the views of M St. Jours (*ibid.*, p. 161) as to the history of the names

France *La G., B.S.G. Paris* **12** (1905): 145–148. **Bénard**
L'érosion marine à la Pointe de la Coubre. Par C. Benard *With Diagrams*

France. *La G., B.S G Paris* **11** (1905) 257–284, 343–358, 413–434 **Fabre.**
Le sol de la Gascogne. Par L. A. Fabre. *With Maps and Sections*

France. *La G., B S G. Paris* **11** (1905): 435–446. — –
Explorations glaciaires accomplies en France pendant l'été 1904. *With Map*

France. *La G., B.S.G. Paris* **12** (1905). 178–180. **Rabot.**
Histoire d'un torrent des Alpes françaises. Par C. Rabot.

France—Census. — –
Résultats statistiques du Recensement général de la population effectué le 24 mars 1901 Tome I Introduction, Population légale ou de résidence habituelle pour la France entière, Population présente: Regions de Paris, du Nord et de l'Est Paris, 1904 Size 11×9, pp. xxiv. and 870.

France—Isle de France. **Gallois.**
Atti Congresso Internat. Sc. Storiche, 1903, **10** (1904): 19 24.
Une région naturelle française; le pays de France. Del Prof. L. Gallois. *With Map*
"La France," in its narrowest sense, was formerly the designation of a district circumscribed by the Seine, the Marne, and the Oise, and tributaries of the two last. The use still lingers in the designations Mareil and Châtenay "en France."

France—Speleogy. *Spelunca* **6** (No. 41) (1905): pp 192 **Martel.**
La Spéléologie au XX^e Siècle (Revue et Bibliographie des recherches souterraines de 1901 a 1905). Par E. A. Martel. 1^re Ptie: France. *With Sections.*

France—Tarn *Rev. G* **55** (1905) 293–301. **Nauzières.**
Le Sidobre. Par R. Nauzières *With Map and Illustrations.*

France and Switzerland. *Questions Diplomatiques* **9** (1905): 142–146. **Pinon.**
Le Simplon et la Faucille. Par René Pinon.

Germany. *M.V. Halle-a.-S.* (1905): 17 41. **Grössler**
Die Einteilung des Landes zwischen unterer Saale und Mulde in Gaue und Archidiakonate. Von Prof. Dr. H. Grössler. *With Map.*

Germany—Fuhne. *M.V.E. Halle-a.-S.* (1905): 1-16. **Müller.**
Die hydrographische Entwicklung der Fuhneniederung. Von Dr A. Müller. *With Map.*

The **Fuhne** is a tributary of the Saale.

Germany—Hydrology. *Petermanns M.* **51** (1905): 187-189. **Fischer.**
Die Wasserstandsbewegung in den norddeutschen Flussgebieten im hydrologischen Jahre 1901. Von Dr. F. J. Fischer.

Germany—Magdeburg. *M V.E. Halle-a.-S.* (1905): 44-79. **Jacob.**
Die geographisch bedingten wirtschaftlichen Grundlagen der Magdeburger Gegend. Von T. Jacob. *With Maps.*

Germany Prussia. *Naturw Wochenschrift* **20** (1905): 561-571, 577-585. **Hilbert.**
Eine naturwissenschaftliche Wanderung über die kurische Nehrung. Von Dr. Richard Hilbert. *With Map and Illustrations.*

Germany—Schleswig. *Globus* **88** (1905): 109 111 **Moritz.**
Die Hallig Jordsand. Von E. Moritz.

Germany—Wends. *Forsch. deutsch. Landes- u. Volksk.* **16** (1) (1905) · pp. 124. **Witte.**
Wendische Bevölkerungsreste in Mecklenburg. Von Dr. H. Witte. *With Map.*

Greece. *G.Z.* **11** (1905): 445 175. **Chalikiopoulos.**
Wirtschaftsgeographische Skizze Thessaliens. Von Dr. L. Chalikiopoulos.

Greece—Platæa. **Zikos.**
K. Zikos. Etude Historique sur la Détermination des Positions de la Bataille de Platées. [In Greek and French.] Athens, 1905. Size 7 × 5, pp. 70. *Map.*

Greece—Santorin. *B.S.R. Belge G.* **28** (1904): 413-431; **29** (1905): 47-62. **Hautteocœur.**
L'île de Santorin. Par H. Hauttecœur. *With Map.*

Holland - Hydrology. *B.S. Belge Géol.* **19** (1905): *Procès-Verbaux*, 59-65. **Dubois.**
E. Dubois. Études sur les eaux souterraines des Pays-Bas. L'eau douce du sous-sol des Dunes et des Polders.

Holland - Ice-age. *K.A.W. Amsterdam, P. Sec. Sc.* **7** (1904): 40-41. **Dubois**
On the direction and the starting-point of the diluvial ice-motion over the Netherlands. By Prof. E. Dubois.

Holland—Tides. **Van der Stok.**
Etudes des Phénomènes de Marée sur les Côtes Néerlandaises (K. Nederlandsch Meteorologisch Instituut, No. 90). II. Résultats d'Observations faites à bord des Bateaux-Phares Néerlandais, par J. P. Van der Stok (pp. 84). III. Tables des Courants, by the same (pp. 106). Utrecht, 1905. Size 10 × 7. *Diagrams. Presented by the K Nederlandsch Meteorologisch Instituut.*

Hungary. *Abrégé B.S. Hongroise G.* **31** (1903): 54-60. **Balogh**
Die mittlere Höhe des grossen ungarischen Tieflandes. Von Dr. M. Balogh. (*Földr. Közl.* **31** (1903): 379 390. *Map.*)

Hungary. *Abrégé B.S. Hongroise G.* **33** (1905): 33-42. **Beluleszko.**
Eine siedlungsgeographische Untersuchung der Unteren Donaugegend. Von A. Beluleszko. (*Földr. Közl.* **33** (1905): 83-95 *Maps.*)

Hungary. *Abrégé B.S. Hongroise G.* **32** (1904): 85-95. **Bogdánfy.**
Die Wasserführung der Tisza. Von Edmund von Bogdánfy. (*Földr. Közl.* **32** (1904): 275-283.)

Hungary. *Abrégé B.S.G. Hongroise* **32** (1904): 175-180. **Cholnoky.**
Die wissenschaftliche Erforschung des Alföld. Von Dr. Eugen von Cholnoky. (*Földr. Közl.* **32** (1904): 456-461.)

Hungary. *Abrégé B.S. Hongroise G.* **32** (1904): 101-108. **Györy**
Die Mittlere Höhe des kleinen ungarischen Tieflandes. Von Ella v. Györy. (*Földr. Közl.* **32** (1904): 314-319.)

Hungary. *Abrégé B.S. Hongroise G.* **33** (1905): 44–46. **Harmos and Stojanovits.**
Die mittlere Höhe der Diluvialplatte zwischen der Donau und der Tisza. Von E Harmos und D. Stojanovits. (*Földr. Közl.* **33** (1905): 116–117. *Section.*)

Hungary. *Abrégé B.S. Hongroise G.* **33** (1905): 76 77 **Klein**
Eigenheiten des Klimas von Ungarn. Von A. Klein. (*Földr. Közl.* **33** (1905): 240–247. *Diagrams.*)

Hungary. *Abrégé B S. Hongroise G.* **32** (1904): 150 173 **Márki.**
Ueber den Namen Kolozsvár. Von Alexander Márki. (*Földr. Közl.* **32** (1904): 398–419.)

Hungary. *Abrégé B.S. Hongroise G.* **32** (1904): 1 11. **Mihutia.**
Die hydrographischen Verhältnisse des Kalkplateaus von Vaskóh. Von A. Mihutia. (*Földr. Közl.* **32** (1904): 1–31.)

Hungary. *Abrégé B.S. Hongroise G.* **32** (1904): 133–136. **Timkó**
Das Eseder Moor. Von E. Timkó (*Földr. Közl.* **32** (1904): 369 381. *Illustrations.*)

Hungary—Population. *Abrégé B S. Hongroise G.* **33** (1905): 7–10. **Zombory**
Die Volksdichtigkeit Ungarns im Gebiete jenseits der Donau auf Grund der Daten der Volkszählung vom Jahre 1900. Von J Zombory. (*Földr Közl.* **33** (1905). 18–21.)

Iceland. *Sitzb. K.A.W. Wien* **113**, *Abt.* 2*a* (1904): 183–269 **Hann.**
Die Anomalien der Witterung auf Island in dem Zeitraume 1851 bis 1900 und deren Beziehungen zu den gleichzeitigen Witterungsanomalien in Nordwesteuropa. Von J. Hann

Iceland. *G. Ts* **18** (1905 6): 98 112. **Thoroddsen**
Lavaørkener og Vulkaner paa Islands Højland. Geografiske og geologiske Undersøgelser. Af Prof. Dr. T Thoroddsen.

Italy. *B S.G. Italiana* **6** (1905): 609 619. **Revelli.**
La Contea di Mòdica. Contributo al Glossario dei nomi territoriali italiani. Nota del Prof. P. Revelli.

Italy—Marches. **Porena and Others**
Club Escursionisti di Iesi. Perchè si debba dire Marche e non Marca. Lettere dei Professori F Porena, O. Marinelli, C. Maranelli Iesi, 1905. Size 9½ × 6¼, pp. 14.

Italy—Place-names. **Grasso**
Atti Congresso Internat. Sc. Storiche (1903): **10** (1904): 27–38
Del significato geografico del nome *Fiesso* in Italia, e di un antico nome *ad Flexum* incorporato nel nome di "S. Pietro in fine." Del Prof Gabriele Grasso *Map.*

Italy—Sardinia. *Rev. G. Italiana* **12** (1905): 267–273. **Loperfido**
Nuovo Collegamento Geodetico dell' Isola di Sardegna al Continente. Di Antonio Loperfido. *Map.*

Italy—Sicily. **Wermert**
Die Insel Sicilien in volkswirtschaftlicher, kultureller und sozialer Beziehung Von G. Wermert Berlin: Dietrich Reimer (Ernst Vohsen), 1905 Size 11½ × 8, pp 6 and 488 *Map.* *Price* 10*s.* [To be reviewed]

Italy—Stromboli. *C.R.* **141** (1905): 575–579. **Lacroix.**
Sur le tremblement de terre ressenti le 8 septembre à Stromboli et sur l'état actuel de ce volcan Dr. A Lacroix.

Jura. *B.S.G. Lille* **44** (1905): 141–148. **Blanchard**
Le Jura Par R. Blanchard. *With Illustrations*

Limnology—Seiches *Riv G. Italiana* **12** (1905): 127–135, 216 225, 291–299 **Magrini**
I recenti studi sulle sesse e le sesse nei laghi italiani. Del Dott. G. P. Magrini *Diagrams.* *Also separate copy, presented by the Author.*

Northern Europe **Harvie-Brown.**
Travels of a Naturalist in Northern Europe. Norway, 1871; Archangel, 1872, Petchora, 1875. By J. A. Harvie-Brown. 2 vols. London: T. Fisher Unwin, 1905. Size 9½ × 6¼, pp xiv and 542. *Maps and Illustrations. Price* 63*s. net. Presented by the Publisher.* [To be reviewed.]

North Sea. *Conseil Explor. Mer. Publ. Circ.* No. 19 (1904): pp. 8. **Helland-Hansen.**
Zur Ozeanographie des Nordmeeres. Resumé eines am 22. Juli gehaltenen Vortrags von B. Helland-Hansen. *Diagrams.*

Norway—Flora. **Norman.**
Norges Arktiske Flora. II. Oversigtlig Fremstilling af Karplanternes Udbredning, forhold til omgivelserne M. M. 2den. Halv. J. M. Norman. Kristiania: H. Aschehoug & Co., 1901. Size 10 × 6½, pp. 443–623.

Norway and Sweden. *G.Z.* 11 (1905): 425–435. **Reusch.**
Norwegens Verhaltnis zu Schweden vom geographischen Geschichtspunkte aus. Von Dr. H. Reusch. *With Maps*

Norway and Sweden. *National G. Mag.* **16** (1905): 429–431. ———
A Comparison of Norway and Sweden.

Norway—Meteorology. **Mohn.**
Jahrbuch des Norwegischen Meteorologischen Instituts für 1900 (pp xii and 122) Ditto, 1901 (pp. xii. and 122). Ditto, 1902 (pp. xii. and 122). Ditto, 1903 (pp. xii. and 120). Christiania, 1901–04. Size 13 × 10.

United Kingdom—England. **Cox**
The Royal Forests of England. By J. C Cox, LL.D [The Antiquary's Books] London: Methuen & Co. 1905. Size 9 × 6, pp. xvi. and 372. *Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

An interesting book, supplying for the first time a comprehensive and systematic sketch of the history of the Royal forests, from material in the Record Office and elsewhere. The standpoint is, however, rarely that of the geographer, the book dealing rather with forest customs and administration than with changes in the extent of the forests, their relation to soil and climate, and such matters. Still, the data supplied would no doubt prove useful to any one desirous of tracing the changes to which the surface of the country has been subject within historic times.

United Kingdom—Somersetshire. **Richmond.**
The Story of Somersetshire. By W. R. Richmond. London. Wake & Dean, [*not dated*] Size 7½ × 5, pp xii and 296. *Map and Illustrations. Price 1s 6d. Presented by the Publishers.*

Traces, in an interesting way, the part played by Somersetshire in the leading events of English history.

ASIA.

Ceylon. **Warren.**
Ceylon Administration Reports, 1904. Part i. Civil Survey. Report of Mr. P. D Warren, Surveyor-General. Size 13½ × 8½, pp. 36. *Maps, Plans, and Illustrations. Presented by the Surveyor-General, Ceylon.*

Central Asia. **Hedin and Ekholm.**
Sven Hedin. Scientific Results of a Journey in Central Asia, 1899–1902. Vol **2**. Lop-Nor, by Dr. S. Hedin. Vol. **5**, Part *ia* Meteorologie, von Dr. N Ekholm I Die Beobachtungen, 1894 1897 und 1899–1902. Stockholm: P A Norstedt & Söner, 1905 Size 13 × 10, pp. 716, xii., and 402 *Maps and Illustrations. Maps*, vol. **2**, *in separate case*, size 16 × 11½. *Presented by Dr S. Hedin.*

Central Asia—Tian Shan. *B. American G.S.* **37** (1905): 513–530. **Huntington.**
The Mountains and Kibitkas of Tian Shan. By E. Huntington. *With Sections.*

Central Asia—Tian Shan. **Merzbacher.**
The Central Tian-Shan Mountains, 1902–1903. By Dr. G. Merzbacher. Published under the authority of the Royal Geographical Society. London: John Murray, 1905. Size 9 × 6, pp. viii. and 294. *Map and Illustrations. Price 12s. net. Presented by the Publisher.*

China. *Abrégé B.S. Hongroise G.* **33** (1905): 67–75. **Cholnoky.**
Die grosse chinesische Tiefebene Von E. v Cholnoky. (*Földr. Közl.* **33** (1905): 224–239 *Map and Illustrations.*)

China. **Cholnoky.**
River-Regulation and Soil-Amelioration in China. By Dr. Eugenius Cholnoky. [In Hungarian.] (Vizügyi Közlemények, xxi. Füzot.) Budapest, 1905. Size 10 × 7, pp. 100. *Maps and Illustrations. Presented by the Author.*

China. **Hardy.**

John Chinaman at Home. Sketches of Men, Manners, and Things in China. By the Rev. E. J. Hardy. London: T. Fisher Unwin, 1905. Size 9 × 6, pp. 336. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publisher.*

The author travelled a good deal in Central and Southern China when on leave of absence from his post as chaplain to the forces at Hong-Kong. He has evidently taken much pains to understand the Chinese character, and his sketches of native life away from the reach of foreign influence are of some original value

China. ———

China. Imperial Maritime Customs I.—Statistical Series: Nos 3 and 4. Returns of Trade (46th Issue) and Trade Reports (40th Issue), 1904. Part i.—Report on the Working of the Post Office (a continuation of Part i.—Abstract of Statistics of the Trade of China). Shanghai: Kelly & Walsh, 1905. Size 11 × 8½, pp. 20. *Map.*

China—Historical. *English Historical Rev.* **20** (1905): 625-636. **Parker.**

China and the Ancient Cabul Valley. By E. H. Parker.

China—Kiao-Chou. *Deutsche G. Blätter* **28** (1905): 87-112. **Kolshorn**

Die wirtschaftliche Bedeutung und Entwickelung des Kiautschougebietes. Von Walther Kolshorn.

China - Sechuan *La G., B.S.G. Paris* **12** (1905): 87-98. **Legendre.**

Le Sseu-tch'ouan, son sol, son climat, ses productions. Par Dr. A. F. Legendre

China—Trade. ———

China. Imperial Maritime Customs. I. Statistical Series. Nos 3 and 4 Returns of Trade and Trade Reports, 1904. Part ii Reports and Statistics for each Port Vol. i. Northern Ports. Shanghai, 1905. Size 11½ × 8½, pp. xvi. and 534. *Maps and Diagrams.*

Chinese Empire—Tibet. *J. and P. Asiatic S. Bengal* **1** (1905): 106 116. **Chandra Das**

The Monasteries of Tibet. By Rai Sarat Chandra Das.

Chinese Empire—Tibet. **Chandra Das.**
J Asiatic S. Bengal **73**, Pt. i., Extra No. (1904): 80 93

The Hierarchy of the Dalai Lama (1406–1745). By Rai Sarat Chandra Das.

Chinese Empire—Tibet. **Chandra Das.**
J. Asiatic S. Bengal **73**, Pt. i., Extra No. (1904): 94 102.

Tibet under the Tartar Emperors of China in the 13th century A.D. By Rai Sarat Chandra Das.

Chinese Empire—Tibet. *Globus* **88** (1905): 149 154. **Götz.**

Wilh. Filchners Reise in Ost-Tibet. Von W Götz. *With Illustrations.*

See note in the *Journal* for May 1905 (p. 562).

Chinese Empire—Tibet. **Rawling**

The Great Plateau, being an account of exploration in Central Tibet, 1903, and of the Gartok Expedition, 1904-1905. By Captain C G. Rawling. London E Arnold, 1905. Size 9 × 6, pp. xii. and 324. *Maps and Illustrations. Price* 15*s. net. Presented by the Publisher.*

This important work will be reviewed in an early number.

Chinese Turkestan. *B. Comité Asie Française* **5** (1905): 370–372. ———

Une mission archéologique au Turkestan Chinois.

On an expedition undertaken by M. P. Pelliot.

Dutch East Indies. **Blink.**

Nederlandsch Oost- en West-Indië. Geographisch, ethnographisch en economisch beschreven. Door Dr. H. Blink. Eerste Deel. Leiden: E. J. Brill, 1905. Size 10 × 7, pp. xii. and 576. *Maps and Illustrations.*

To be completed in two volumes.

Dutch East Indies—Volcanoes. **Baren.**

De Vulkanen van Ned.-Indië (Overgedrukt uit de Encyclopædie van N.-I.) Van J. van Baren. (N.P. 1905.) Size 10½ × 7, pp. [7]. *Presented by the Author.*

Eastern Asia. *Ann. G.* **14** (1905): 245-258. **Gallois.**

La structure de l'Asie orientale d'après les travaux récents. Par L. Gallois.

Eastern Asia. **Jagatjit Singh.**

My Travels in China, Japan, and Java, 1903. By H. H. the Raja-i-Rajgan Jagatjit Singh of Kapurthala. London: Hutchinson & Co., 1905. Size 9 × 6½, pp. xii. and 226. *Map and Illustrations. Price* 12*s*. 6*d*. *net. Presented by the Publishers.* [To be reviewed.]

Eastern Asia. **Little.**

The Far East. By Archibald Little. (The "Regions of the World" Series, edited by H. J. Mackinder.) Oxford: The Clarendon Press, 1905. Size 9½ × 6, pp. viii. and 334. *Maps and Illustrations. Price* 7*s*. 6*d*. *net. Presented by the Delegates of the Press.*

See review, *ante*.

Eastern Asia. **Whitney.**

Jungle Trails and Jungle People. Travel, Adventure, and Observation in the Far East. By C. Whitney. London: T W. Laurie, 1905. Size 9 × 6, pp xvi. and 310. *Illustrations. Price* 12*s*. *net. Presented by the Publisher.*

Striking descriptions of the jungles of the Far East (India, Sumatra, Siam, etc.), with the men and beasts that inhabit them.

Eastern Asia—Russo-Japanese Treaty. *A travers le Monde* **11** (1905): 293–294. ———

Résultats géographiques du Traité de Portsmouth *With Maps*

Eastern Asia—Sakhalin. *B.S. Études Col.* **12** (1905): 541–554. **Geerts.**

L'Ile de Sakhaline. Par R. Geerts. *With Map and Illustrations.*

French Indo-China—Cambodia. **Gerini.**

Imp. and Asiatic Quarterly Rev **17** (1904): 355–398: **19** (1905): 361–394; **20** (1905): 89–101.

A Trip to the Ancient Ruins of Kamboja. By Lieut.-Col. G. E. Gerini

French Indo-China—Laos. *Ann. G.* **14** (1905): 274–276. **Parcevaux.**

Les voies d'accès au Laos supérieur. Par H. de Parcevaux.

French Indo-China—Railway. *B.S.G. Lille* **44** (1905): 188 191. ———

Le Trans-Indo-Chinois. *With Map.*

India. *Imp. and Asiatic Quarterly Rev.* **20** (1905): 39–46. **Fischer.**

The Mopand Irrigation Project, Madras. By General J. F. Fischer.

India—Assam. **Barnes.**

Report on the Trade between Assam and the adjoining Foreign Tribes and Countries for the Three Years ending March 31, 1905. By H. C. Barnes. Shillong, 1905. Size 10 × 8½, pp. 20.

India—Baluchistan. *Imp and Asiatic Quarterly Rev.* **20** (1905): 10–18. **Black.**

Baluchistan and its Possibilities. By C. E. D. Black.

A useful summary of existing knowledge, with a discussion of the strategic advantages offered by the country. Mr. Black urges the advisability of an economic and statistical survey.

India—Bengal. **Hill.**

Indian Records Series. Bengal in 1756 1757. A selection of Public and Private Papers dealing with the affairs of the British in Bengal during the reign of Siraj-uddaula Edited with Notes and an Historical Introduction by S. C. Hill. 3 vols. Published for the Government of India. London: J. Murray, 1905. Size 9½ × 6½, pp. (vol. i.) ccxii. and 308, (vol. ii.) xx. and 470; (vol. iii.) viii. and 488. *Maps, Plans, and Illustrations. Price* (3 *vols.*), 36*s*. *net. Presented by the Publisher.*

India—Calcutta. **Blechynden.**

Calcutta, Past and Present. By Kathleen Blechynden. London: W. Thacker and Co., 1905. Size 8½ × 5½, pp. xvi. and 246. *Illustrations. Presented by the Publishers.*

This work does not profess to compete with existing histories of English enterprise in Bengal, but aims rather at pourtraying the personal life of the actors in that field. The author possesses the advantage of a family connection with Calcutta extending over a number of years, which has put in her hands many personal records, besides maps on which changes were recorded as they occurred.

India—Earthquake. *Rev. G. Italiana* **12** (1905): 312–317. **Alfani.**

Il grande terremoto d'India del 4 aprile 1905, e le registrazioni sismiche all' Observatorio Ximeniano di Firenze. Del P. Guido Alfani.

India—Historical. **Lyall.**
The Rise and Expansion of the British Dominion in India. By Sir A. Lyall, K.C.B., etc. 3rd edit. London. John Murray, 1905. Size 9 × 6, pp. xviii. and 356. *Maps. Price 5s. net. Presented by the Publisher.*

This forms practically a new work, the whole having been re-cast and much extended, its value being thus greatly enhanced.

India—N.-W. Frontier. *J. Asiatic S. Bengal* **73**, Pt. 3, Extra No. (1904): 1–34. **Rose.**
Customs in the Trans-border territories of the North-West Frontier Province. Communicated by H. A. Rose.

India—River Húgli. **Vernon-Harcourt.**
Minutes of P.I. Civil Engineers **160** (1905): 100–210.
The River Hooghly. By L. F. Vernon-Harcourt. *With Maps.*
Noticed in the November number (p. 551).

Japan—Volcanic Islands. *J. Tōkyō G.S.* **17** (1905): 274–276. **Kanehara.**
A New Volcanic Island appeared near S. Augustino (Volcano Islands). By Nobuyasu Kanehara. *With Map.* [In Japanese.]

Korea. *Iz. Imp. Russ. G S.* **40** (1904): 330–354. **Korf.**
The population of Korea. By N A. Korf. [In Russian.]

Korea. **Rockhill.**
China's Intercourse with Korea from the Fifteenth Century to 1895. By W W. Rockhill. London: Luzac & Co, 1905. Size 8½ × 5½, pp. 60. *Illustrations. Price 3s. 6d. net. Presented by the Publishers.*
See note in the December number.

Malay Archipelago—Celebes. *Globus* **88** (1905). 154–158, 171–175, 191–195. **Richter.**
Unsere gegenwärtige Kenntnis der Ethnographie von Celebes. Von O. Richter.

Malay Archipelago—Celebes. **Sarasin.**
Reisen in Celebes ausgeführt in den Jahren 1893–1896 und 1902–1903. Von Paul und Fritz Sarasin. 2 vols. Wiesbaden: C. W. Kreidel, 1905. Size 9½ × 6½, pp. (vol. 1) xviii and 382; (vol 2) x and 390. *Maps and Illustrations. Presented by the Authors.* [To be reviewed.]

Malay Archipelago—Sumatra. **Blok.**
K.A.W. Amsterdam, P. Sect. Sc. **7** (1905): 453–459.
The connection between the primary triangulation of South Sumatra and that of the West Coast of Sumatra. By S. Blok. *With Maps.*
Cf Note in the December number.

Persia. **Morgan**
Mission scientifique en Perse. Par J. de Morgan. Tome III. 1 Partie. Études géologiques. Géologie Stratigraphique. Paris: E. Leroux, 1905. Size 11½ × 9, pp. iv. and 184. *Map and Illustrations.*

Persia. *A travers le Monde* **11** (1905). 349. — —
Projet d'un nouveau Chemin de fer russe sur la Frontière de Perse (Erivan à Djoulfa). *With Map.*

Tibet and Turkestan **Crosby.**
Tibet and Turkestan, a Journey through old Lands and a Study of New Conditions. By O. T. Crosby. New York and London: G. P. Putnam's Sons, 1905. Size 8½ × 6, pp. xvi. and 332. *Map and Illustrations. Price 10s. 6d. net. Presented by the Author.* [To be reviewed.]

AFRICA.

Abyssinia. *B.S.G. Marseille* **29** (1905): 25–28. **Le Roux.**
Seconde visite au Négus d'Abyssinie. Conférence de H. Le Roux.

Africa—Disease. **Balfour.**
First Report of the Wellcome Research Laboratories at the Gordon Memorial College, Khartoum. By the Director, Dr A. Balfour. Khartoum: Dep. of Education, Sudan Government, 1904. Size 11 × 8, pp. 84. *Map and Illustrations. Presented by Dr. A. Balfour.*

Africa—Historical. *M.K.K.G. Ges. Wien* **48** (1905): 283–383. **Hartig.**
Ältere Entdeckungsgeschichte und Kartographie Afrikas mit Bourguignon d'Anville als Schlusspunkt (1749). Von Dr. O. Hartig. *With Maps.*

Africa—Railways. *Deutsch. Kolonialzeitung* **22** (1905): 393–394. **Singelmann.**
Afrikanische Querbahn-Projekte. Von C Singelmann. *With Map*
Refers to projected railways across South Africa between 10° and 20° S

Algeria and Morocco. *B.S.G. Marseille* **29** (1905): 5–17. **Levat.**
Les confins de l'Algérie et du Maroc Conférence de D. Levat. *With Map*

Algeria and Tunis. *B.S.G. Marseille* **29** (1905): 46–60. **Gallois.**
Oasis algériennes et tunisiennes Par E. Gallois.

Algerian Sahara. **Phillipps.**
In the Desert. By L. March Phillipps. London E. Arnold. Size 9½ × 6, pp. xvi. and 288. *Map and Illustrations. Price 12s. 6d. net. Presented by the Publisher.*

Contains some vivid sketches of desert scenery, with an attempt to pourtray the influence it has exercised on Arab character, poetry, and art.

British East Africa. **Bailie, etc**
Report on the Pastoral and Agricultural Capabilities of the East Africa Protectorate. By J. C. Bailie, T. C. Hinds, and F. R. N. Findlay. Johannesburg, [1904]. Size 8½ × 5½, pp 24. *Presented by Lord Hindlip.*
See note in the December number.

British East Africa. **Hindlip.**
British East Africa, Past, Present, and Future. By Lord Hindlip. London: T. Fisher Unwin, 1905. Size 8 × 5, pp. xiv and 142. *Price 3s. 6d. net. Presented by the Publisher.*

Discusses various questions affecting the future of British East Africa from full knowledge gained on the spot.

British East Africa. ———
Africa No. 6 (1905). Reports relating to the Administration of the East Africa Protectorate. London. Wyman & Sons, 1905. Size 13½ × 8½, pp. 54. *Price 5½d.*

Central Africa. *B.S G. Italiana* **6** (1905). 678–708. **Baccari.**
I grandi laghi Africani. Conferenza del dott. E. Baccari. *With Illustrations.*

Account of travels in the region of the Central African rift-valley, with ascents in the volcanic group north of Kivu.

Central Africa. **Hoffmann.**
Petermanns M. **51** (1905). 81–90, 108–115, 129–136, 150 161.
Die tiefsten Temperaturen auf den Hochländern des südaquatorialen tropischen Afrika (insbesondere des Seenhochlandes) Von Dr J. Hoffmann

East Africa—Language. **Madan.**
Swahili (Zanzibar) Grammar. By A. C. Madan. Oxford: Clarendon Press, 1905. Size 7 × 5, pp. 62. *Price 1s. net. Presented by the Publishers.*

Egypt. **Lucas.**
Ministry of Finance. The Blackened Rocks of the Nile Cataracts and of the Egyptian Deserts. By A. Lucas. Cairo, 1905. Size 11 × 7½, pp. 58.
To be noticed in the Monthly Record.

Egyptian Sudan. **Gleichen.**
The Anglo-Egyptian Sudan: A Compendium prepared by Officers of the Sudan Government. Edited by Lieut.-Colonel Count Gleichen, C.M.G., etc. 2 vols London: Wyman & Sons, 1905. Size 12½ × 10, pp. (vol. 1) xiv. and 372; (vol. 2) viii. and 236. *Maps and Illustrations. Price* (vol. 1) 10s., (vol. 2) 7s. 6d. *Presented.*

By far the most complete and systematic description of the Eastern Sudan that has yet appeared, forming a valuable summary of our geographical knowledge at the present time, with much information on the resources, administration, etc, of the country.

French Sudan. **Fourneau.**
Reseignements Colon., Comité Afrique Française (1905): 105–122.
La ravitaillement par le Bas-Niger (Mission Lucien Fourneau, 1902–04). Capitaine L. Fourneau. *With Map and Illustrations.*

French West Africa. **Paulhiac.**

Promenades Lointaines. Sahara, Niger, Tombouctou, Touareg, par le Lieutenant H. Paulhiac. Préface par Hugues Le Roux. Paris: Plon-Nourrit et Cie., [*not dated*]. Size 8 × 5½, pp. xxii. and 498. *Maps and Illustrations. Price 5s.*

The author, who has played a part of some importance in the extension of French influence on the southern borders of the Sahara, here presents the results of his observations on many points affecting the future of that region, and the relations between Europeans and natives. The work is more than a mere record of travel, and bears witness to thoughtful study of the problems involved.

German East Africa. *Deutsch. Kolonialzeitung* **22** (1905): 370–372. **Arning.**

Das Dondeland und seine Bewohner. Von Dr. W. Arning.

German East Africa. **Classe.**

Miss. Catholiques **37** (1905): 411–414, 425–432, 437–440

A travers l'Afrique Equatoriale. Mœurs et Coutumes des Bagoyé. Par le R. P Classe. *Illustrations and Map.*

The Bagoye dwell to the north and east of Lake Kivu.

German East Africa. *Globus* **88** (1905): 167–171. ———

Das Bahnprojekt Kilwa—Nyassa. *With Illustrations.*

Gold Coast. ———

Northern Territories of the Gold Coast. Report for 1904. Colonial Reports, Annual No. 457, 1905. Pp. 30. *Price 2d*

Gough Island. **Brown, Wright, and Darbishire.**

J Linnean S. (Botany) **37** (1905): 238–250, 263–267.

The Botany of Gough Island. By R. N Rudmose Brown, C. H Wright, and O. V Darbishire *With Plates.*

Kamerun. *Deutsches Kolonialblatt* **16** (1905) 526–533. **[Dominik.]**

Die Bapea Expedition. *With Map.*

The Bapea are a little-known tribe to the north of the Sanaga.

Kamerun. *M. Deutsch Schutzgeb.* **18** (1905): 179–193. **Moisel and Schipper**

Begleitworte zu der Karte 3 "Der deutsche Logone und seine Nachbargebiete" Von M. Moisel. *With Map.*

Bemerkungen zu den Planen von Dikoa. Von Leutnant Schipper. *With Plans.*

Madagascar. *Rev. Madagascar* (1905) (2): 298–307. **Hamélius**

Plantain le Pirate, "Grand Roi de Madagascar" (d'après Clément Downing, son historien). Par E. Hamélius.

J. Plantain, one of the most famous of the Madagascar pirates, was born in Jamaica in 1700.

Madagascar **Pichot.**

Miss. Catholiques **37** (1905): 449–452, 460 463, 473–475, 485–488, 498–500, 511–512.

Au pays des Antankares. Par le R. P. Paul Pichot. *With Maps and Illustrations.*

Madagascar—Historical. *Rev. de Madagascar* **7** (1905). 2e Sem., 3 14. **Grandidier.**

Voyage de Mayeur dans le Centre de Madagascar, 1758–1787. Par A Grandidier.

Madagascar—Zoology. *Rev. de Madagascar* **7** (1905): 111 128. **Grandidier.**

Les animaux disparus de Madagascar: gisements, époques et causes de leur disparition. Par G. Grandidier.

Morocco. *B S.G. Lille* **44** (1905): 251–255. **Déchaud.**

Ports de l'ouest marocain. Extraits sommaires du Rapport de T. Déchaud *With Map.*

Morocco. **Lemoine.**

Renseignements Colon., Comité Afrique Française (1905): 65–92, 141–155, 157–182

Mission dans le Maroc Occidental (Automne 1904). Par P. Lemoine *With Maps and Illustrations.*

Natal. ———

Colony of Natal. Report of the Coal Testing Committee, 1904–05. Maritzburg: P. Davis & Sons, 1905 Size 13 × 8½, pp. 90 *Diagrams and Illustrations.*

Niger. *B.S.G. Com. Paris* **27** (1905): 471–490. ———

Notice sur le moyen Niger.

Nigeria. [**Bedwell.**]
Southern Nigeria Report for 1904. Colonial Reports, Annual No. 459, 1905. Size 10 × 6, pp. 68. *Diagram* *Price* 4½*d.*

Nile. **Kumm.**
Die Beduinenstämme des Niltbals. Statistische Uebersichten zusammengestellt von H K W. Kumm. Size 9 × 6, pp. 26.

Réunion. *K.A.W. Amsterdam, P Sect Sc.* **7** (1905): 602 610. **Oudemans.**
A Short Account of the Determination of the Longitude of St. Denis (Island of Reunion), executed in 1874. By Prof J. A. C. Oudemans.

Rhodesia. **Wright and Knight.**
Railways in Rhodesia. A few notes on their construction, and on the country through which they pass. By E. H. Smith Wright. With a description of the Victoria Falls, by E. F. Knight. London, [*not dated*] Size 10 × 8, pp. 56. *Maps, Illustrations, and Diagram. Presented by the British South Africa Railway.*

Rhodesia. ———
Rhodesia Chamber of Mines (Incorporated), Bulawayo. Tenth Annual Report for the year ended 31st March, 1905. London, 1905 Size 10 × 8, pp. iv. and 110. *Map.*

Rhodesia—Archæology. *P. Rhodesia Sci. Ass.* **4** (1903–4): 83–86. **Hall.**
Majiri Ruins, Motinkoi (M'Telekwe) Valley By R N Hall. *Plan and Illustrations.*

Rhodesia—Archæology. *P. Rhodesia Sci. Ass.* **5** (1905): 5–7. **White.**
Description of the Lumene Ruins, Gwanda District. By Franklin White. *Plan and Illustrations*

Rhodesia.—Matopos. *P. Rhodesia Sci. Ass.* **4** (1903-04): 72 76 **Mennell.**
Some Aspects of the Matopos. By F. P. Mennell *Illustrations.*

Rhodesia—Zimbabwe. *P. Rhodesia Sci. Ass* **5** (1905): 11-20. **White**
The Large Elliptical Ruin at Zimbabwe. By Franklin White. *Plan and Illustrations.*

Tunis—Carthage. **Moore.**
Carthage of the Phœnicians in the Light of Modern Excavation. By Mabel Moore. London: W. Heinemann, 1905. Size 8 × 5½, pp. 180. *Illustrations. Price* 6*s.* *Presented by the Publisher.*

An interesting account of the results of excavations carried out under the direction of the Rev. A. L. Delattre, archpriest of the Cathedral of St Louis of Carthage.

Uganda. *P. Zoolog. S.* 1905 (2): 184–191. **Delmé-Radcliffe.**
Rough Notes on the Natural History of the Country West of Lake Victoria Nyanza. By Lieut.-Colonel C. Delmé-Radcliffe.

West Africa. **Lugard.**
A Tropical Dependency. An Outline of the Ancient History of the Western Soudan, with an Account of the Modern Settlement of Northern Nigeria By Flora L. Shaw (Lady Lugard). London: J. Nisbet & Co., 1905. Size 10 × 7, pp. viii. and 508. *Maps. Price* 18*s.* *net. Presented by the Publishers.* [To be reviewed.]

NORTH AMERICA.

Alaska. *National G. Mag.* **16** (1905): 427-429. **Gilbert.**
Some Notes on the Fox Island Passes, Alaska By J. J. Gilbert.

On recent survey work by the U.S. Coast and Geodetic Survey.

America—Cartography. **Paltsits**
Maps illustrating Early Discovery and Exploration in America, 1502-1530. Reproduced by Photography from the original Manuscripts. Issued under the Direction of Dr. E. L. Stevenson. By Victor H. Paltsits. (From the *American Historical Review*, vol. **10**, No. 4, pp. 863–867.) Size 10½ × 7.

Account of a fine collection of facsimiles of early maps, including some of the most important productions of the early years of the sixteenth century.

Canada. *T. Canadian I.* **8** (1905): 23-39. **Drummond.**
How Plant Life is Distributed in Canada, and Why. By Dr. A. T. Drummond.

Canada—British Columbia. **Smith**

Shell-heaps of the Lower Fraser River, British Columbia. By H. I. Smith. ('Publ. Jesup North Pacific Expedition,' vol. **2**, part iv. = *Mem Amer. Museum Nat. Hist.*, vol. **4**, part iv.) [New York], 1903. Size 14 × 11, pp. 191. *Illustrations.*

Canada—British Columbia. **Swanton.**

Contributions to the Ethnology of the Haida. By J. R. Swanton. ('Publ. Jesup North Pacific Expedition,' vol. **5**, part i. = *Mem. Amer. Museum Nat. Hist.*) Leiden and New York, 1905. Size 14 × 11, pp. 300. *Maps and Illustrations.*

Canada—Historical. **Douglas**

Old France in the New World. Quebec in the Seventeenth Century By J. Douglas, LL D. Cleveland and London: The Burrows Brothers Co., 1905. Size 8½ × 6, pp. 598. *Illustrations. Price* $2.50

An interesting account of the beginnings of Canadian history under the French, written apparently with full knowledge of the sources of information for the period in question, though some at least of the ground has been covered by previous publications.

Lake Ontario. *T Canadian I.* **8** (1905) 1 10 **Tully**

The fluctuations of Lake Ontario. By K Tully

Mexico. *B. American G.S.* **37** (1905): 531 543. **Hovey.**

The Western Sierra Madre of the State of Chihuahua, Mexico. By E. O Hovey. *With Illustrations.*

See note in *Journal* for August, 1905, p 218, and *ante*, p. 90.

Mexico. *Globus* **88** (1905) 165 167. **Sapper.**

Das mexikanische Territorium Quintana Roo. Von K. Sapper. *With Map*

Mexico. **Sierra**

Mexico, its Social Evolution . . Monumental Inventory summing up in masterly expositions the great progress of the Nation in the Nineteenth Century. . . . Literary Editor: Licentiate Justus Sierra. Translated into English by G Sentiñón 2 vols. (in 3) Mexico. J. Ballesca & Co, 1900 1904. Size 17 × 12½, pp. (vol. 1) 778; (vol **2**) 414. *Maps and Illustrations. Presented by the Mexican Minister of Justice.*

United States. *Rev. G.* **55** (1905): 306-309. **Tricoche**

Dans les Mauvaises Terres des Dakotas (États-Unis). Par G. N. Tricoche. *With Illustrations.*

One of the illustrations shows the remarkable Tour du Diable, though this is not, strictly speaking, in the "Bad lands."

United States. *National G. Mag.* **16** (1905): 389-397. ——

The Central Great Plains. *With Illustrations.*

United States—California *J. Geol.* **13** (1905): 358 362. **Lee.**

Note on the Glacier of Mount Lyell, California. By W. T. Lee. *With Illustrations.*

United States—Cement Industry. *B.U.S. Geol Surv.*, No. 213 (1905): pp. 396. **Eckel.**

Cement Materials and Industry of the United States. By E. C. Eckel. *With Maps.*

United States—Central Plains. **Darton.**

U.S. Geol. Surv., *Prof. Paper*, No. 32 (1905). pp. 434.

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United States—Colorado. *J. Geology* **13** (1905): 285-312. **Westgate.**

The Twin Lakes Glaciated Area, Colorado. By L. G. Westgate. *With Map and Illustrations.*

United States—Delaware River. *J. Franklin I.* **160** (1905): 161-179. **Webster**

The Improvement of the Delaware River and Harbor and the Landing Facilities of the Port of Philadelphia. By G. S. Webster. *With Map and Illustrations.*

United States—Early Travels. **Thwaites.**

Early Western Travels, 1748-1846 Edited . . . by Dr. R. G. Thwaites. Vol 13, Nuttall's Travels into the Arkansa Territory, 1819 (pp. 366). Vols. **14** (pp. 322);

15 (pp. 356); **16** (pp 292); and **17** (pp. 308), James's Account of S. H Long's Expedition, 1819-1820. Vol. 18, Pattie's Personal Narrative, 1824-1830; Willard's Inland Trade with New Mexico, 1825, and Downfall of the Fredonian Republic; and Malte-Brun's Account of Mexico (pp. 380). Cleveland, Ohio. The Arthur H. Clark Company, 1905. Size 10 × 6½. *Maps and Illustrations. Price* $4 *net per volume.*

United States—Early Travel. **Wagner.**

Leonard's Narrative. Adventures of Zenas Leonard, Fur Trader and Trapper, 1831-1836. Reprinted from the rare original of 1839. Edited by W. F. Wagner, M.D. Cleveland The Burrows Brothers Co., 1904. Size 9½ × 6½, pp. 318 *Map. Price* $5.00 *net.*

Leonard was one of the most adventurous of the early thuners and traders who made known the Rocky mountain region in the early part of the nineteenth century. His description of the Yosemite valley is the earliest known.

United States—Geological Survey. - --

Twenty-Fifth Annual Report of the Director of the United States Geological Survey, 1903-4. Washington, 1904 Size 11 × 8, pp 388 *Maps.*

Includes a report on reclamation service work.

United States—Historical. **Kaye.**

English Colonial Administration under Lord Clarendon, 1660-1667. By P. L. Kaye, PH.D. (Johns Hopkins University Studies, Series xxiii. Nos. 5, 6.) Baltimore, 1905. Size 10 × 6½, pp 150.

United States—Virginia, etc. **Hutchins and Hicks**

Thomas Hutchins. A Topographical Description of Virginia, Pennsylvania, Maryland, and North Carolina. Reprinted from the original edition of 1778. Edited by F. C Hicks. Cleveland. The Burrows Brothers Co, 1904. Size 10 × 7, pp 144 *Maps, Plans, etc. Price* 16*s.* 8*d. net.*

Reprint of a rare work of much importance for the early geography of the Eastern United States. A reproduction of the original map is given, and there is a biographical sketch and list of the author's works.

United States—Hydrology. **Fuller**

Bibliographic Review and Index of Papers relating to Underground Waters published by the United States Geological Survey, 1879-1904 By M L. Fuller. (U.S. Geological Survey, Water Supply, Paper No 120) Washington, 1905. Size 9 × 6, pp. 128

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Underground Waters of Eastern United States M. L. Fuller. (U.S. Geological Survey, Water Supply Paper No. 114) Washington, 1905 Size 9 × 6, pp. 286. *Maps and Illustrations.*

United States—Indian Territory. **Taff and Bain.**

U.S. Geol. Surv, *Prof. Paper* No. 31 (1904): pp. 98.

Preliminary Report on the Geology of the Arbuckle and Wichita Mountains in Indian Territory and Oklahoma, by J. A. Taff, with an Appendix on Reported Ore Deposits of the Wichita Mountains, by H F Bain. *Maps and Plates.*

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A particular case of Glacial Erosion. By F. W. Sardeson. *With Diagrams.*

United States—New York. *B. Geolog. S. America* **16** (1905): 229-242. **Tarr.**

Drainage features of Central New York. By R. S. Tarr. *With Maps.*

United States—Washington. *Globus* **88** (1905) · 254 257 **Bauer.**

Washington, der "Immergrüne Staat," Wirtschafts-geographische Skizze unter Benutzung des amtlichen statistischen Materials Von F Bauer.

United States—Wisconsin and New York. *J. Geology* **13** (1905): 363-374. **Hobbs.**

Examples of Joint-controlled Drainage from Wisconsin and New York. By W. H. Hobbs. *With Maps and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. **Ross.**

Quebracho and Cotton in the Argentine Chaco. Foreign Office, Miscellaneous, No 639, 1905. Size 9½ × 6, pp. 10. *Price* 1*d.*

Argentine—Cordoba. *B.A. Nacional Cienc. Cordoba* **17** (1904): 383–414 **Doering**
Resultados Hipsométricos de una Excursión á la Sierra de Córdoba (1901). Por Oscar Doering. *Profiles.*

Brazil. *Sitzb. K.A.W. Wien* **113** *Abt.* 1 (1904): 379–466. **Hussak**
Ueber das Vorkommen von Palladium und Platin in Brasilien. Von E. Hussak. *With Plates.*

Brazil. **Norzagaray-Eliecchea.**
Suggestions and Scheme for Steam Navigation of the Rio Negro, submitted to His Excellency the Governor, and to the Honourable Congress of Amazonas, by L. Norzagaray-Eliecchea. Size 8½ × 5½, pp. 160. *Portrait and Diagram. Presented by the Consul-General of Colombia.*

Reviewed November, 1905 (p. 549).

Brazil. **Schmidt**
Indianerstudien in Zentralbrasilien, Erlebnisse und ethnologische Ergebnisse einer Reise in den Jahren 1900 bis 1901. Von Dr. M. Schmidt. Berlin: D. Reimer (Ernst Vohsen), 1905. Size 10½ × 7, pp. xiv. and 456. *Maps and Illustrations. Price* 10s.

Results of ethnological researches among some of the least-known primitive tribes of Brazil. Before starting on his journey, the author had the benefit of the advice of Dr. Karl von den Steinen, and other German authorities on the region of the upper Xingu, whose work he was thus able to continue to the best advantage. The first (and smaller) part of the book describes the author's experiences, the rest being devoted to the ethnological results. The book is well illustrated.

Brazil—Amazonas. *Globus* **88** (1905): 86–91. **Koch.**
Abschluss meiner Reisen in den Flussgebieten des Rio Negro and Yapura. Von Dr. T. Koch. *Illustrations.*

The earlier part of the journey was referred to in vol. **26**, p. 89.

Central America *Popular Sci. Monthly* **67** (1905): 231–236. **Michaud.**
The Climate of the Central American Plateau. By Dr G. Michaud. *With Illustrations*

Central America—Mosquito Coast. *Globus* **88** (1905): 91–92. **Neuhaus.**
Zur ethnographischen und archäologischen Untersuchung der Meskitokuste. Von J. Neuhaus.

Cuba. *B.S.G. Com. Havre* **22** (1905): 257–271. **Berchon.**
L'Ile de Cuba. Par C. Berchon. *With Map.*

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Cuba unter der nordamerikanischen Militärregierung und als Republik. Von Prof Dr. K. Sapper. *With Map.*

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Ts K Ned. Aard. Genoots. Amsterdam **22** (1905): 769–780
Het rapport Havelaar en de toestanden in de Kolonie Curaçao. Door Jhr. L. C. van Panhuys.

Ecuador **Reiss.**
Wilhelm Reiss: Ecuador, 1870–1874. Petrographische Untersuchungen ausgeführt im Mineralogisch-Petrographischen Institut der Universitat Berlin Hefts 1 and 2. Berlin: A. Asher & Co, 1901–1904. Size 13 × 9½, pp. 301.

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Panama Canal. *B.S.G. Belge G.* **29** (1905): 153–167, 241–280. **Kraentzel.**
Le Canal de Panama. Par F. Kraentzel. *With Map and Section.*

Patagonia. **Outes.**
La edad de la piedra en Patagonia. Estudio de Arqueología comparada por F. F. Outes. ('An. Museo Nac. Buenos Aires,' **12** (Ser. 3*a*, t. v.), pp. 203–575.) Buenos Aires, 1905. Size 11 × 7½. *Map and Illustrations. Presented by the Author.*

Peru—Mining. *B. Cuerpo Ingen. Minas Perú,* No. 24 (1905). pp. 64 **Denegri.**
Estadistica minera del Perú en 1904. Por M. A. Denegri.

South America—Ethnology. *Globus* **88** (1905): 101–108. **Nordenskiöld.**
Ueber Quichua sprechende Indianer an den Ostabhängen der Anden im Grenzgebiet zwischen Peru und Bolivia. Von E. Nordenskiöld. *With Map and Illustrations.*

Trinidad. *T. Canadian I.* **8** (1905): 137–149. **Guppy.**
The Growth of Trinidad. By R. J. L. Guppy. *With Map and Diagrams.*

West Indies. **Lucas and Atchley.**
A Historical Geography of the British Colonies. By C. P. Lucas, C.B. Vol 2 The West Indies. Second Edition, revised and brought up to date by C. Atchley, Librarian of the Colonial Office Oxford: Clarendon Press, 1905. Size 7½ × 5½, pp 348. *Maps. Price 7s. 6d. Presented by the Publishers.*

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Sage über die Entstehung der Inseln Map und Rumung und der Landschaft Nimigil (Japinseln). Von A Senfft.

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Die Marianen. Von Hermann H. L. W. Costenoble. *Illustrations.*

New Guinea—Dutch. *Ts. K. Ned Aard. Genoots.* **22** (1905): 763–768 ———
De Nieuw-Guinea-expeditie van het Koninklijk Nederlandsch Aardrijkskundig Genootschap. Door Ij. *With Map*

See note in Monthly Record (December, p. 674).

New Guinea—German *Globus* **88** (1905): 69–72. **Parkinson.**
St Matthias und die Inseln Kerué und Tench. Von R Parkinson.

New Guinea—German *Z Ges E. Berlin* (1905): 555–558. **Pöch.**
Bemerkungen über die Eingeborenen von Deutsch-New-Guinea. Briefliche Mitteilung von Dr. R. Pöch.

New South Wales—Meteorology. **Russell**
Results of Meteorological Observations in New South Wales during 1900, 1901, and 1902. Under the direction of H. C. Russell Sydney, 1904. Size 9½ × 6, pp. 216.

New Zealand. **Heim.**
Neuseeland. Zwei Vorträge gehalten von Dr. Alb Heim. (Neujahrsblatt der Naturforschenden Gesellschaft in Zürich auf das Jahr 1905; 107 Stück.) Zürich. Size 11 × 9, pp. 42. *Plate and Illustrations.*

The outcome of a visit to the islands in 1901–2. The first paper deals with history, the second gives an excellent sketch of the physical aspects of the country.

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Long Water (Whangaroa). A Sketch in the North of north Island of New Zealand. By H. Mason. *With Illustrations.*

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Notes from my South Sea Log. By L. Becke. London: T. Werner Laurie, [*not dated*]. Size 8 × 5½, pp. vi and 352. *Map and Portrait. Price 6s. net. Presented by the Publisher.*

Tales of adventure, and sketches of life among the Pacific islanders, from log-books kept by the author while supercargo in the South seas.

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Sprachen und Sprachgebiete in Deutsch-Mikronesien. Von H. Seidel.

Queensland. ———
Statistics of Queensland, 1904. Brisbane, 1905 Size 13½ × 8½, pp xii. and 456. *Presented by the Government Statistician.*

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POLAR REGIONS.

Antarctic. **Armitage.**

Two Years in the Antarctic. Being a Narrative of the British National Antarctic Expedition. By Lieut. A. B. Armitage. London: E. Arnold, 1905. Size 9 × 6, pp. xx. and 316. *Map and Illustrations. Price* 15*s. net. Presented by the Publisher*

Reviewed in the December number (p 666).

Antarctic. **Mill**

The Siege of the South Pole: the Story of Antarctic Exploration Dr. H R. Mill. London: Alston Rivers, 1905. Size 9 × 6, pp. xvi. and 456. *Maps and Illustrations. Price* 7*s.* 6*d. net. Presented by the Publisher.*

See review in the December number (p. 665).

Antarctic—Climatology. *Globus* **88** (1905). 184–190. **Krebs.**

Streitfragen der antarktischen Klimatologie. Von W Krebs *With Maps.*

Antarctic—French Expedition. *La G., B.S.G Paris* **11** (1905): 409 412. **Charcot**

Rapport préliminaire de l'expédition antarctique française Par J B. Charcot *With Map.*

Arctic. *B.S.G. Marseille* **29** (1905) · 88–96. **Marcillac**

Projet d'exploration aérostatique au Pole Nord Par P Marcillac

Greenland—Eskimo. *Petermanns M.* **51** (1905) · 186–187. **Steensby.**

Die Einwanderung der Eskimos nach Grönland. Von H. P. Steensby

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A. Faustini Le Campagne Baleniere nella Storia delle Scoperte Polari (Estratto dalla Rivista di Fisica, Matematica, e Scienze Naturali, Anno v., 1904). Pavia, 1904. Size 9½ × 6½, pp. 12.

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Cartography. **Sandler.**

Die Reformation de Kartographie um 1900. Von C. Sandler München und Berlin: R. Oldenbourg, 1905 Size 13 × 9½, pp 30, *Maps* (separate), size 24 × 15. *Price* 20*m. Presented by the Publisher* [To be reviewed]

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Das Erdsphäroid und seine Abbildung Von Hermann Wagner.

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Sulla scoperta della Bussola nautica e sulla storia della Repubblica Amalfitana Del Cap. Umberto Moretti

Longitude Determination. *Petermanns M* **51** (1905) · 140–141 **Hammer.**

Genauigkeit der Langenunterschiedsbestimmung durch Uhrtransport auf der Eisenbahn und dem Schiffe. Von Prof Dr E Hammer

Mathematical Geography. *Petermanns M* **51** (1905): 121–124. **Graber.**

Das "Orthogonal Tellurium" und die Konstruktive Lösung von Aufgaben aus dem Gebiet der mathematischen Geographie. Von Dr. H. V. Graber. *With Diagrams.*

On an instrument designed by the author as an aid in the teaching of mathematical geography.

Mathematical Geography *Monthly Weather Rev.* **33** (1905): 242–248. —

Improved Methods for finding Altitude and Azimuth, Geographical Position, and the Variation of the Compass. *With Illustrations.*

Surveying **Finsterwalder.**

Abh. Math. Phys. Klasse K. Bayerischen A W. **22** (1904) 223–260

Eine Grundaufgabe der Photogrammetrie und ihre Anwendung auf Ballonaufnahmen Von S. Finsterwalder. *With Illustrations.*

Surveying. *M K K Militärg I.* **24** (1904). 143–180. **Hübl.**

Beiträge zur Stereophotogrammetrie Von A. Freiherrn von Hübl. *With Diagram*

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Eine Erweiterung des Böhlerschen Basismessverfahrens. Von Kapitanleutnant Kurtz. *With Illustrations.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geological Studies. **Sollas.**

The Age of the Earth and other Geological Studies. By W J Sollas. London: T. Fisher Unwin, 1905. Size 9 × 6, pp. xvi. and 328. *Illustrations. Price 10s 6d. net Presented by the Publisher.*

Reprint of articles contributed to various journals, revised and expanded That on the figure of the Earth was noticed in the *Journal* on its first publication (vol. **21**, p. 326).

Geology. **Marr.**

An Introduction to Geology. By J. E. Marr, SC.D., F R.S. Cambridge University Press, 1905. Size 7½ × 5, pp. viii. and 230. *Illustrations. Price 3s. net. Presented by the Publishers.*

An excellent exposition of the general principles of geology, suitable both to the general reader and the student making his first acquaintance with the subject.

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A Treatise on Metamorphism. By C. R. Van Hise. *With Illustrations.*

Geomorphology. *J. of T. Victoria I.* **37**(1905): 214–221. **Hull.**

On Dr. Nansen's Bathymetrical Researches in the Arctic Ocean as compared with those on the Atlantic Coast of Europe. By Prof. E. Hull. *Map*

Glaciers. *M. Deuts. und Oesterr. Alpenv.* (1905): 187–189, 201–203 **Angerer.**

Berichte über die wissenschaftlichen Unternehmungen des D. u. O. A. V, xl. Gletscherbeobachtungen im Ankogel—Hochalpenspitzgebiete in den Jahren 1898 bis 1904. Von Dr. Hans Angerer.

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Sur la dissymétrie de la déperdition electrique en pays de montagne: rôles comparés de l'altitude et du relief. Note de B. Brunhes et A. Baldit.

Hydrology. *G.Z.* **11** (1905): 436 445. **Brückner.**

Die Bilanz des Kreislaufs des Wassers auf der Erde. Von Prof. Dr. E. Brückner.

Hydrology. *Minutes of P I. Civil Engineers* **160** (1905). 349-363. **Stromeyer.**

The Gauging of Streams by Chemical Means. By C. E. Stromeyer. *With Sections*

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Enquiry into the Pressure and Rainfall Conditions of the Trades-monsoon Area. By W. L. Dallas.

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Oscillations of the Solar Activity and the Climate. By Dr. C. Easton. *With Diagram.*

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Zur Periodizität der solaren und klimatischen Schwankungen. Von Dr. C. Easton. *Chart.*

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Die Verteilung des Niederschlags nach den geographischen Breiten. Von J. Bezdek. (*Földr. Közl.* **23** (1904): 283-287. *Map.*)

Meteorology—Temperature. **Hann.**

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Ueber die Temperaturabnahme mit der Höhe bis zu 10 km. nach den Ergebnissen der internationalen Ballonaufstiege. Von J. Hann.

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Conseil Perm. Internat. Explor. Mer., Publ. Circonstance **18** (1904). pp. 6.
Einfluss des Windes auf die Dichte und die Bewegung des Meereswassers. Von J. W. Sandström.

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Conseil Permanent International pour l'Exploration de la Mer. Rapports et Procès-Verbaux. Vol. 3. Edition Anglaise. General Report on the work of the period July, 1902—July, 1904. With 10 Appendixes. Copenhague: A. F. Høst & Fils, 1905. Size 10½ × 8½. *Charts and Diagrams.*

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An Apparatus for the Collection of Bottom-samples. By V W. Ekman. (Conseil Permanent pour l'Exploration de la Mer. Publications de Circonstance, No. 27) Copenhagen, 1905 Size 10 × 7, pp 6. *Illustration.*

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Oceanography—Current Meters. **Ekman and others.**
Kurze Beschreibung eines Propell-Strommessers. Von V. W Ekman (pp. 4) Beschreibung des Bifilar-Strommessers. Von O. Pettersson (pp. 6). Prüfung von Strommessern und Strommessungsversuche in der Nordsee. Von A. M. van Roosendaal und C. H. Wind (pp. 10). (Conseil Permanent International pour l'Exploration de la Mer. Publications de Circonstance, Nos. 24–26.) Copenhagen, 1905. Size 10 × 7. *Plates.*

Oceanography—Currents. **Lenehan.**
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Oceanography—Friction in Sea-water. **Krümmel and Ruppin**
Ueber die innere Reibung des Seewassers. Von O. Krümmel und E. Ruppin. Kiel, 1905. Size 13 × 10½, pp (10).

Oceanography—Indian Ocean. **Lutgens.**
Oberflächentemperaturen im südlichen Indischen Ozean, 1901-1903 Inaugural-Dissertation zur Erlangung der Doktorwürde . . . von Rudolf Lutgens. Berlin, 1905. Size 10½ × 7½, pp. 16. *Maps and Diagrams. Presented by the Author.*

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North Sea Fisheries Investigation Committee Report on Fishery and Hydrographical Investigations in the North Sea and Adjacent Waters, 1902-1903 London Wyman & Sons, 1905. Size 14½ × 11, pp. viii. and 618. *Diagrams Price 8s. 9d. Presented by the North Sea Fisheries Investigation Committee* [To be reviewed.]

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A Classification of Rivers based on Water-supply. By Isaiah Bowman
Mainly a translation of a chapter in Woeikoff's 'Klimate der Erde.'

Terrestrial Magnetism. *Mem. R Astronomical G.* **55**, Appendix (1904): 29 65 **Chree**
An Enquiry into the nature of the relationship existing between Sun spot frequency and Terrestrial Magnetism. By Dr. C. Chree.

Volcanic Phenomena. *Globus* **88** (1905) 234-238, 249 253. **Hundhausen**
Beobachtungen aus verschiedenen vulkanischen Gebieten. Von Dr. J Hundhausen. *With Map and Illustrations.*
Observations in the Yellowstone, New Zealand, Hawaii, etc.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *G. Teacher* **3** (1905): 125-131. **Semple.**
Mountain Peoples in Relation to their Soil. A Study in Human Geography. By E. C. Semple.

Anthropology. *G. Teacher* **3** (1905): 28-31. **Barton.**
The Distribution of Rural Occupations. *With Map.*

Colonisation. **Hertz.**
The Old Colonial System. By G. B. Hertz. Manchester: University Press; London: Sherratt and Hughes, 1905. Size 9½ × 6, pp. xii. and 232. *Price 5s. net. Presented by the Publishers.*

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Der Atlantische Ozean als handelsgeographisches Mittelmeer betrachtet. Von M. Eckert. (Friedrich Ratzels Gedächtnis, 1904, pp. 39-60.)

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La Production et la Consommation mondiales du Caoutchouc. Par H. Brenier et F. Claverie.

Commercial Geography. **Smith.**
The Organization of Ocean Commerce. By J. Russell Smith, PH.D. (Publ. University of Pennsylvania. Series in Political Economy and Public Law No. 17.) Philadelphia: Published for the University, 1905. Size 10½ × 6½, pp. viii. and 156. *Map. Presented by the University of Pennsylvania.*
Reviewed in vol. **26** (p. 552).

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Ueber die geographische Verbreitung der Erdnuss und ihre Bedeutung als Nahrungsmittel. Von J. Block.

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Tin Deposits of the World. By S. Fawns London: The Mining Journal, 1905. Size 9 × 6, pp. xii. and 240. *Maps and Illustrations. Presented by the Publishers.*
A useful summary of tin-mining throughout the world, with descriptions of the geological formations in which the deposits occur in the various countries, the methods of working, and an outline of the statistics of production.

Economic Geography—Agriculture. **Freidrich.**
Die Entwickelung des Pflanzenbaues. Von E. Friedrich. (Friedrich Ratzels Gedächtnis, 1904, pp. 79-122.)

Ethnology Jesup Expedition. **Boas.**
Publications of the Jesup North Pacific Expedition. Edited by Franz Boas. [vol 1] 1898-1900 (pp. 454); [vol. 2] parts i.-iv.; [vol. 3] parts i. and ii.; [vol. 4] part i; [vol. 6] part. i; [vol 7] part. i. (= *Mem. Amer. Museum Nat. Hist.*, New York). New York and Leiden, 1900-1905. Size 14 × 11 *Maps and Plates.*
Vol. **4**, part i, deals with the decorative art of the Amur tribes; Vol. **7**, part i., with the material culture of the Chukchis; the rest treat of the Indians of British Columbia and adjoining regions.

Historical. ———
Atti del Congresso Internazionale di Scienze Storiche (Roma, 1-9 Aprile, 1903). Vol. **10**. Atti della Sezione VI.: Storia della Geografia, Geografia Storica. Rome: E. Loescher, 1904. Size 10 × 6½, pp. xxvii. and 313. *Price 8 fr. Presented by the Publisher.*
Includes a number of interesting papers on the historical side of geography, the most important of which are entered in the Literature of the Month under their special headings.

Historical. *B.S. Khédiv. G.* **6** S. (1905): 417-434. **Salem Bey.**
Les voyageurs musulmans. Par Mahmoud Salem Bey.

Historical. *Riv. G. Italiana* **12** (1905): 284-290. **Bruzzo.**
Di Fracanzio da Montalboddo, e della sua Raccolta di Viaggi. Del Prof. Giuseppe Bruzzo.
Fracanzio (sometimes spoken of as Fracanzano) was the compiler of the 'Paesi novamente retrovate' (1507).

Historical. ——

Epistola serenissimi Regis Portugalie ad Julium papam Secūdum de Victoria cōtra infideles habita. Paris, 1507. [Reproduction; Lisbon, 1905.] Size 8½ × 6, pp. [8]. *Presented by Señor Eugenio do Canto.*

Account of sea-fights waged by the Portuguese in the early days of their Eastern empire.

Historical. **Marcel.**

Lettres inédites du Cardinal Passionei à d'Anville. Par G Marcel (Extrait du *B.G. hist. et descriptive*, No. 3, 1904.) Paris: Imp. Nationale, 1905. Size 9½ × 6¼, pp. 24. *Presented by the Author.*

A collection of fifteen letters from the Cardinal to D'Anville, lately brought to light, bears witness to the perseverance and industry of the cartographer in collecting information on the progress of geographical knowledge.

Historical. **Grande.**

Stefano Grande. Le Carte d'America di Giacomo Gastaldi. Contributo alla storia della cartografia del secolo XVI. Torino: C. Clausen, Hans Rinck, Succ., 1905. Size 10 × 6½, pp. 166. *Facsimile Maps. Presented by the Publisher.*

Historical—Hanseatic League. **Daenell**

Zur hansischen Schiffahrt im Mittelalter. Von E. Daenell. (Friedrich Ratzels Gedächtnis, 1904, pp. 23–38.)

Historical—Vespucci. *Riv. G. Italiana* **12** (1905): 308-311. **Uzielli**

A proposito della medaglia in onore del Vespucci. Di Gustavo Uzielli.

BIOGRAPHY.

Bembo. *Atti Congresso Internat. Sc. Storiche*, 1903, **10** (1904): 55 68. **Günther**

Il Cardinale Pietro Bembo e la Geografia. Del Prof. Dott. S. Günther.

Bertelli. *Riv G. Italiana* **12** (1905): 193-203, 340-350. **Baratta.**

L'opera scientifica del P. Timoteo Bertelli (1826–1905). Appunti di M. Baratta. *With Portrait.*

Bertelli dealt chiefly with the history of the compass and terrestrial magnetism

Brazza. *La G., B.S.G. Paris* **12** (1905): 200-202. **Rabot**

Savorgnan de Brazza. Par C. Rabot. *With Portrait.*

Filicaja. *Atti Congresso Internat. Sc. Storiche*, 1903, **10** (1904): 39-54. **Gorrini.**

Un viaggiatore italiano nel Brasile; Baccio da Filicaja (1565 1609) Del Dott Giacomo Gorrini

Light. ——

Colonel Light, the Founder of Adelaide. Unveiling of Memorial. 1905 Size 9½ × 7, pp. 28. *Portrait and Illustrations.*

See note in the December number.

Megiser. **Hantzsch.**

Hieronymus Megiser, ein Leipziger Geograph vor 300 Jahren. Von V. Hantzsch. (Friedrich Ratzels Gedächtnis, 1904, pp. 123–140.)

Philippi. **Arana**

El Doctor Don Rodolfo Amando Philippi, su vida i sus obras. Por Diego Barros Arana. Santiago de Chile, 1904. Size 10 × 7, pp. viii. and 248. *Portraits Presented by the Author.*

Reclus. **Magistris.**

L. F. de Magistris. Eliseo Reclus (1830–1905). Iesi, 1905. Size 9 × 6½, pp. 40. *Presented by the Author.*

Reclus. *La G., B.S.G. Paris* **12** (1905): 81-86. **Schrader.**

Élisée Reclus. Par F. Schrader. *With Portrait.*

Sowerbutts. *J. Manchester G.S.* **20** (1904): 181 182. ——

Eli Sowerbutts. *With Portrait.*

Richter. *Riv. G. Italiana* **12** (1905): 274-283, 351-368. **Marinelli.**

L'opera geografica di Edoardo Richter. Appunti di O. Marinelli.

Wallace. ——

My Life: A Record of Events and Opinions. By A. R. Wallace. 2 vols. London: Chapman & Hall, 1905. Size 9 × 6, pp. (vol. 1) xii. and 436; (vol. 2) viii. and 460. *Maps and Illustrations. Price 25s. net. Presented by the Author.*

The extent and importance of Dr. Wallace's travels gives this autobiography a special interest to geographers.

Ziegler. *National G. Mag.* 16 (1905): 355-357. ——

Mr. William Ziegler. *With Portrait.*

GENERAL.

Almanac. **Kettle and Jenkins.**

Pearson's Nautical Almanack and General Tide Tables, 1906. Edited by W. R. Kettle and H. D. Jenkins. London: Imray & Co. Size 9 × 6, pp. 392. *Price 1s. Presented by the Publishers.*

Bibliography. **Raveneau.**

Annales de Géographie. XIV^e Bibliographie Géographique Annuelle, 1904. Publiée sous la direction de Louis Raveneau. Paris: A. Colin, [1905]. Size 10 × 6½, pp. 336.

Borneo and West Africa. **Cator.**

Everyday Life among the Head Hunters and other experiences from East to West. By Dorothy Cator. London: Longmans & Co., 1905. Size 8 × 5½, pp. xiv. and 212. *Illustrations. Price 5s. net. Presented by the Publishers.*

The author has resided, as the wife of a Government official, both in North Borneo and West Africa, and gives an interesting insight into the everyday life, with its numberless trials and vexations, of those who uphold British influence in the remote corners of the Empire. There is also some account of the Borneo natives.

Coins. **Macdonald.**

Catalogue of Greek Coins in the Hunterian Collection, University of Glasgow. Vol. 3. Further Asia, Northern Africa, Western Europe. By G. Macdonald, LL.D. Glasgow: J. Maclehose & Sons, 1905. Size 12 × 9, pp. vi. and 800. *Plates. Presented by the Trustees of the Hunterian Coin Catalogue Fund.*

Descriptive Geography. **Reclus.**

Histoire d'une Montagne. Par É. Reclus. Nouvelle édition. Paris: J. Hetzel et Cie., [*not dated*]. Size 7½ × 5, pp. 306. *Illustrations. Price 3 fr.*

Descriptive Geography. **Reclus.**

Histoire d'un Ruisseau. Par É. Reclus. 18th edition. Paris. J. Hetzel, [*not dated*]. Size 7½ × 5, pp. 316. *Illustrations. Price 3 fr.*

These two works are, in spite of their small compass, among the masterpieces of their author, bringing out in a way that has never been excelled the importance of geography as a stimulus to the imaginative and poetical faculties. They treat, not only of the physical processes involved in the history of mountain and stream, but of the influence exercised by them on the life of the dwellers in their neighbourhood.

Educational. ——

Board of Education, Whitehall, London, S.W. Regulations for Secondary Schools. Geography. Size 13¼ × 8½, pp. 4.

Educational—Text-book. **Herbertson.**

The Oxford Geographies. Vol. 2. The Junior Geography. By A. J. Herbertson, PH.D. Oxford: Clarendon Press, 1905. Size 7½ × 5, pp. 288. *Maps. Price 2s. Presented by the Publishers.*

This excellent text-book keeps in view throughout the influence on geographical facts of physical conditions, a clear comprehension of which is made the basis of the whole teaching. It is intended to embrace so much of regional geography as is necessary for the Oxford Junior Local Examinations.

Geography. *G. Teacher* 3 (1905): 97-103. **Dann.**

What is Geography? By E. W. Dann.

Instructions to Travellers. **Neumayer.**

Anleitung zu wissenschaftlichen Beobachtungen auf Reisen . . . herausgegeben von Prof. Dr. G. von Neumayer. 3 Aufl., Lief. i.-iv. Hanover: Dr. M. Jänecke, 1905. Size 9 × 6. *Presented by the Publisher.*

Mountains. **Grand-Carteret.**

John Grand-Carteret. La Montagne à travers les ages. II La Montagne d'aujourd'hui. Grenoble: C Dumas, 1904. Size 11 × 9, pp. 494. *Illustrations.* *Price* 25*s.*

The first volume appeared in 1903 (*Journal*, vol. **21**, p. 481) The work is now complete, and forms a history of mountains from the standpoint of their influence on mankind from the earliest days to the present.

Nomenclature. **De la Blache.**

Atti Congresso Internat. Sc. Storiche, 1903, **10** (1904): 11–17.

De la signification populaire des noms de pays. Del Prof. P. Vidal de la Blache.

Stieler's Hand-Atlas. *Petermanns M.* **51** (1905): 137–139. **Habenicht.**

Stieler's Hand-Atlas, ein Kompendium der Erdmessungen des vorigen Jahrhunderts. Von H. Habenicht. *With Maps.*

The map of Africa in the newest issue is shown side by side with that in the first edition (1820).

Telegraphs. *Monthly Rev.* **21** (1905): 104–110. **Bright.**

Imperial Consolidation by Telegraphy. By C Bright.

World. **Moncrieff.**

The World of To-day: A Survey of the Lands and Peoples of the Globe as seen in Travel and Commerce. By A. R. Hope Moncrieff. Vol. 3. London: The Gresham Publishing Co., 1905. Size 11 × 7½, pp. vi. and 280. *Maps and Illustrations.* *Price* 8*s. net.* *Presented by the Publisher.*

This volume deals with Africa.

Year-Book. **Wagner.**

Geographisches Jahrbuch, xxvii Band 1904. Herausgegeben von Hermann Wagner Gotha: J. Perthes, 1905. Size 8½ × 5½, pp. viii. and 466. *Price* 15 *Marks.*

This part deals with recent progress in the study of the structure of the Earth's crust, and in the geography of special regions (Polar, Russian Asia, and North America)

OLDER WORKS ADDED TO THE SOCIETY'S COLLECTIONS IN 1905.

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Apianus, P.—Cosmographia, corregida y añadida por Gemma Frisio. *Maps and Diagrams.* Size 8½ × 6. *Antwerp*, 1575

Barrington, Hon. Daines.—Miscellanies. *Maps and Plate.* Size 11 × 9. *London*, 1781.
[Includes, besides the tracts on the North Pole and on Other's voyage, a translation of Maurelle's voyage in the South Seas.]

Bartoli, Cosimo.—Del Modo di misurare le distantie, le superficie, i corpi, le piante, le provincie, le prospettive, etc. *Diagrams.* Size 9 × 6½. *Venice*, 1589.

Beamish, N. L.—The Discovery of America by Northmen in the Tenth Century, with notices of the Early Settlements of the Irish in the Western Hemisphere *Maps and Illustration.* Size 9 × 5½. *London*, 1841.

Bordone, Benedetto.—Isolario. *Maps, Plans, etc.* Size 12 × 8½. *Venice*, 1547.

Bosworth, Rev. J.—King Alfred's Anglo-Saxon Version of the Compendious History of the World by Orosius. *Maps and Plates.* Size 10 × 6½. *London*, 1859.

Bouchette, Joseph.—A Topographical Description of the Province of Lower Canada, with Remarks upon Upper Canada, etc. *Maps, Plans, Illustrations, and Portrait.* Size 10 × 6. *London*, 1815.

Boulton, D'Arcy.—Sketch of His Majesty's Province of Upper Canada. *Map.* Size 11 × 8½. *London*, 1805.

Brandan, St.—Les Voyages Merveilleux de Saint Brandan à la recherche du Paradis Terrestre, . . . avec Introduction par Francisque Michel. Size 7½ × 5. *Paris*, 1878.

Cartier.—Voyage de Jaques Cartier au Canada en 1534. Nouvelle édition, publiée . . . par M. H. Michelant. Documents Inédits . . . communiqués par M. Alfred Ramé. *Maps.* Size 7½ × 5. *Paris*, 1865.

Casas, Bartolome de las.—Brevissima Relacion de la Destruycion de las Indias. Size 8 × 5½. Seville, 1552. [*Barcelona*, 1646.]

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Froger, Le Sieur.—Relation d'un Voyage fait en 1695, 1696, et 1697, aux Côtes d'Afrique, Détroit de Magellan, Brésil, Cayenne et Isles Antilles. *Maps, Plans, and Illustrations.* Size 6½ × 3½.

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[Contains one of the earliest memoirs of Columbus.]

Glareanus, H.—Henrici Glareani Helvetii, Poetæ Laureati, de Geographia Liber Unus. *Diagrams.* Size 8 × 6 *Freiburg im Breisgau*, 1533.

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Huttich, Grynaeus, and Varrerius.—Novus Orbis, id est, Navigationes Primae in Americam: quibus adjunximus, Gasparis Varrerii discursum super Ophyra Regione. . . . Size 6 × 3½. *Rotterdam*, 1616.

[**Jefferys, Thomas**].—The Natural and Civil History of the French Dominions in North and South America. *Maps and Plans.* Size 14 × 9. *London*, 1761.

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Lilius, Z.—Zachariæ Lilii Vicetini Orbis Breviarium. *Diagrams.* Size 8½ × 6. [*Venice, circ.* 1495-9.]

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L[odewyk], G. M. A. W.—Prima Pars Descriptionis Itineris Navalis in Indiam Orientalem. [Houtman's voyage.] *Maps and Illustrations.* Size 13½ × 10 *Amsterdam,* 1598.

Mangoni, Rosario.—Ricerche Topografiche ed Archeologiche sull Isola di Capri, da servire de Guida á viaggiatori. *Map.* Size 7 × 4. *Naples,* 1831.

Morisotus, Claudius Bartholomæus.—Orbis Maritimi sive Rerum in Mari et Littoribus gestarum Generalis Historia. . . . *Maps and Illustrations.* Size 13 × 8. *Divione (Dijon),* 1643.

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Ogilby, John.—A Relation of Remarkable Passages in two Embassies from the East India Company of the United Provinces to . . . China. 2 vols. *Maps and Illustrations.* Size 16½ × 10½. *London,* 1671–1673.

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Quadus, Matthias.—Fasciculus Geographicus complectens praecipuarum Totius Orbis Regionnum Tabulas circiter centum. *Maps.* Size 11 × 8. *Cologne,* 1608

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Sagri, N.—Ragionamenti sopra le Varieta dei Flussi et Riflussi del Mare Oceano Occidentale *Diagrams.* Size 8 × 5½ *Venice,* 1574.

Salmon, T.—Modern History, or the Present State of all Nations. Illustrated . by Hermann Moll. 3 vols. Size 10½ × 8½. *Maps and Plates.* *London,* 1739

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Thevenot, M.—Relations de divers Voyages curieux . . . Nouvelle Edition; augmentée de plusieurs Relations curieuses. 2 vols. *Maps and Illustrations.* Size 11 × 9. *Paris,* 1696.

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Whitehead, John.—Exploration of Mount Kina Balu, North Borneo. *Plates and Illustrations.* Size 14½ × 10. *London,* 1893.

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Hypsometrische Karte von Bayern. Bearbeitet im topographischen Bureau des K. B. Generalstabes. Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheet 16. [Munich, 1905.]

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25-inch—County Maps (first revision):—

Brecknockshire, XIII. 7, 16; XIX. 12, 16; XXV. 4. **Cardiganshire**, XXXIV. 2, 13; XXXVIII. 6, 7, 8; XXXIX. 5, 9; XLVI. 2, 3, 6. **Carmarthenshire**, I. 13; II. 16; VIII. 4; IX. 2, 3; X. 5, 6, 7, 9, 10, 11, 14, 15, 16; XIV. 2, 3, 6, 7, 10, 11, XVIII. 2, 3, 4, 8, 12, 16, XXVII. 4. **Devonshire**, XVII. 13, 15, 16; XXVI. (8 and 4), 12; XXVII 1, 3, 4, 5, 6, 7, 8, 9, 10; XXVIII. 1, 5; XLII. 2, 3, 4, 6, 7, 8, 11, 12, 14, 15; LIII. 3, 6, 10; LXV. 2, 6, 7, 11; LXXVII. 2; LXXX. 2, 4, 8, 11, 12, 13, 16; LXXXIX. 3, CII. 15, 16; CIII. 2; CVII. 8, 12, 13, 14, 15, 16; CVIII 13, 15; CIX. 8, 15, 16; CX 9, 10; CXIII. 4, 8, 12; CXIV. 1, 3, 4, 5, 8, 9, 10, 11, 12; CXV. 1, 2, 3, 5, 6, 7, 9. 10, 11. **Lincolnshire**, LXXVII. 2, 5, 6, 10, 14; LXXVIII. 1, 2, 5, 6, 7, 8, 12, 14, 16; LXXIX. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. **Norfolk**, I. 14, 15; VI. 2, 4, 5, 6, 9, 11, 12, 14; VII. 1, 5, 11, 14; XIII 4, 8, 11, 15; XIV. 1, 2, 3, 4, 6, 8, 14, 15, 16; XV. 1, 2, 3, 6, 7, 8, 11; XVI. 7, 10, 14; XXII 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16; XXIII. 1, 2, 6, 7, 8, 9, 10, 13, 14, 16; XXIV. 4, 7, 9, 10, 11, 12, 13, 14, 15; XXXIII 3, 4, 5, 6, 9, 10, 11, 13, 14; XXXIV. 1, 2, 3, 4, 16; XXXV. 1, 2, 3; XLIII. 8; XLIV. 1, 3, 4; LXXXIII. 1, 8, 12; XCIII. 4, XCIV. 1, 2. **Warwickshire**, XLI. 14; XLVII. 13; LII. 10; LIV. 1, 4, 8, 12, 13, 16; LVI. 8, 15, 16; LVII. 1, 7, 14, 15; LVIII. 4; LIX. 1. **Yorkshire** (First Revision of 1891 Survey), CCLXXXI. 5, 6, 7, 10, 11, 12, 15, 16; CCLXXXVIII 15, 16; CCLXXXIX. 13; CCXCIV. 1, 2, 3, 5, 6, 7, 9, 10, 11, 14, CCXCV. 5, 6, 9, 10, 13, 14. 3*s. each*

(*E. Stanford, London Agent.*)

Europe—Central. **K. K. Militär Geographisches Institut**

Neue Uebersichts-Karte von Mittel-Europa Scale 1 : 750,000 or 11·8 stat. miles to 1 inch. Sheet H 7, Orsova. Vienna: K. K. Militär Geographisches Institut.

A new and revised edition of this useful general map is in course of publication. The area has been extended, and it now includes the whole of Europe from the Baltic to Constantinople, and from the Rhone to the Crimea. Relief is shown by brown shading combined with contours at 500 metres intervals. So far only four sheets have been issued out of a total of forty of which the complete map will consist.

Germany. **K. Preussische Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartographischen Abteilungen der Königlichen Preussische Landesaufnahme. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheet (brown hills and contours) 432, Siegen. Berlin, 1904. *Price* 1.50 *mark each sheet.*

ASIA.

Asia Minor. **Kiepert**

Karte von Kleinasien bearbeitet von Dr. Richard Kiepert. Scale 1 : 400,000 or 6·3 stat. miles to an inch. Sheets: A i. (title), C ii Afiun Karahisar. Berlin: Dietrich Reimer (Ernst Vohsen), [1905]. *Price 6 marks.*

Mukden. **K. Preussische Landesaufnahme.**

Die Schlacht bei Mukden. Scale 1 : 168,000 or 2·6 stat. miles to an inch. 8 sheets and text. Berlin: E. S. Mittler & Son, 1905.

A series of eight maps and plans showing the disposition and arrangement of the Japanese and Russian armies during the different stages of the battle of Mukden, accompanied by letterpress giving an account of the operations. The maps are based on the sheets of the 1 : 300,000 German Government map of China.

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 1,000,000 or 15·8 stat miles to an inch. Sheets: 94 and 95 (combined). Kilimanjaro. *Price 2s. each sheet.*—Scale 1 : 250,000 or 3·9 stat. miles to an inch. Sheets: (Northern Nigeria) 51-P, 52-M. *Price 1s 6d. each sheet.* London: Topographical Section, General Staff, War Office, 1905. *Presented by the Director of Military Operations.*

Congo State. **Du Fief.**

Carte de l'État Indépendant du Congo dressée d'après les itinéraires originaux des voyageurs par J. Du Fief. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. 4 sheets. Brussels, 1905.

A new edition of this well-known general map of the Congo Free State has been much wanted for some time. This is only a reprint of the 4th edition of 1900, and in some districts is quite out of date. On the north-east sheet, Lake Albert Edward is shown in the position it occupied before the Anglo-German Boundary Survey.

Portuguese East Africa. **Topographical Section, General Staff.**

Map of Portuguese East Africa. Based on "Carta de Moçambique, 1903," with additions and corrections. Scale 1 : 3,000,000 or 17·3 stat. miles to an inch. London: Topographical Section, General Staff, War Office, 1905. *Price 2s. Presented by the Director of Military Operations.*

Senegal. **Service Géographique de l'Armée, Paris.**

Carte de Sénégal. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: XIII., Dakar; XIV., Thiès. Paris: Service Géographique de l'Armée.

These two sheets form part of a general map of Senegal now in course of publication by the Service Géographique de l'Armée, and include Cape Verde with Dakar and the immediate neighbourhood. The topographical features are from surveys of French officers made during the early part of 1904. The sheets are clearly drawn and artistically printed in colours. Contours are given in brown at intervals of 10 metres, while every fiftieth metre is shown by a thicker line.

Zululand. **Alten and Saunders.**

Map of Zululand. Compiled from surveys by L. M. Alten, under the supervision of C. R. Saunders, Natal Commissioner for Zululand Lands Delimitation Commission. Scale 1 : 316,800 or 5 stat. miles to an inch. Pietermaritzburg: Surveyor-General's Office. *Presented by the Surveyor-General of Natal.*

Prepared specially to show the boundaries of Reserves delimited by the Zululand Lands Delimitation Commission, 1902-1904. In addition to the map, text is given on the map defining the boundaries of the Reserves shown. There are two editions of the map, one coloured and the other printed in black only.

Zululand. **Alten, Hammer, and Middleton.**

Map of Zululand. Compiled from surveys by L. M. Alten, A. Hammer, and F. A. Middleton. Scale 1 : 158,400 or 2·5 stat. miles to an inch. 6 sheets. Pietermaritzburg: Surveyor-General's Office. *Presented by the Surveyor-General of Natal.*

By far the best map of Zululand ever produced. It is, however, a provisional map only, and will doubtless be superseded by a more complete survey later on. Hills are

shown in brown horizontal form lines; the rest of the map is printed in black. Mission stations, kraals, magistrate's offices, European houses, trigonometrical points, forts, telegraphs, and railways are all clearly shown, and a considerable amount of general information given. Heights, in those few instances where they have been determined, are given in figures. The map varies considerably as to the character of the work, and in many parts it is evidently drawn from very approximate sketches.

AMERICA.

Argentina. **Ministerio de Agricultura, Buenos Aires.**

Ministerio de Agricultura. Division de Tierras y Colonias Tierras destinadas para Colonizacion Agricola. Scale 1 : 400,000 or 6·3 stat. miles to an inch. Territorio de Santa Cruz, Zona sud del Rio Santa Cruz; ditto, Zona del Rio Deseado; ditto, Zona de San Julian. Territorio del Neuquen, Zona Andina. Territorio del Chubut, Zona del Rio Senguerr. Scale 1: 1,200,000 or 3·2 stat. miles to an inch. Buenos Aires: Ministerio de Agricultura, 1904. *Presented by W. S. Barclay, Esq.*

The maps mentioned above have been prepared to accompany a report by the Minister of Agriculture of Argentina, and show the lands at present available in the southern part of the country for colonisation. They are on a large scale, and in some instances are diagrammatic in character. However, the geographical information contained is in many cases more complete than that to be found on any other maps in the Society's collection.

Argentina. **Oficina Meteorologica Argentina.**

Estaciones meteorologicas el 30 de Abril de 1904. Scale 1: 1,850,000 or 92·3 stat. miles to an inch. Buenos Aires: Oficina Meteorologica Argentina. *Presented by W. S. Barclay, Esq.*

Buenos Aires. **Ludwig.**

Nuevo Plano del Municipio de Buenos Aires y parte del Partido de Avellaneda segun los datos mas recientes. Scale 1 : 35,000 or 1·8 inch to a stat. mile Buenos Aires: Pablo Ludwig, 1905.

Canada. **Surveyor-General of Canada**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Red Deer Sheet (215), west of Fourth Meridian, revised to September 30, 1905 Ottawa: Department of the Interior, Topographical Surveys Branch, 1905. *Presented by the Canadian Department of the Interior.*

South America. **Philip.**

Philip's Comparative Series of Large Schoolroom Maps South America. Scale 1 : 6,000,000 or 94·7 stat. miles to an inch. London: George Philip & Son, [1905]. *Price 16s. Presented by the Publisher.*

AUSTRALASIA.

New Zealand. **Department of Lands and Survey.**

Map of North Island, showing Land Transactions, 1904–05. Ditto, showing the State of the Public Surveys, 1905 Map of Middle Island, showing Land Transactions, 1904–05. Ditto, showing the state of the Public Surveys, 1905. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Wellington: Department of Lands and Survey, 1905.

These are two interesting maps taken from an official report. The first shows, by four symbols and colouring, the present state of surveys; and the second, lands taken up during the years 1904–05, lands available for settlement, and under Land for Settlement Act Each map is in two sections.

PACIFIC OCEAN.

Marshall Islands. **Jeschke.**

Karte der Verheerungen des Orkans vom 30. Juni 1905 in den Marshall-Inseln. Von Kapitän Jeschke in Jaluit. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1905, Tafel 20. Gotha: Justus Perthes, 1905. *Presented by the Publisher.*

POLAR REGIONS

South Polar Regions. **Schott.**

Meerestiefen im Südpolargebiet nach dem Stand der Kenntnisse bis 1905 von Dr. G. Schott. Scale 1 : 25,000,000 or 394·5 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1905, Tafel 19. Gotha: Justus Perthes, 1905. *Presented by the Publishers.*

A general circular chart of the South Polar Region on Lambert's equal area azimuthal projection, extending from the pole to latitude 30° S., and measuring 20¼ inches in diameter. It is bathymetrically coloured, and shows ocean depths in ten different tints. A light buff indicates depths from 0 to 200 metres, and then follow nine shades of blue, indicating depths at intervals of 1000 metres, with the exception of the lightest tint, which is for 200 to 1000 metres. In the compilation of the chart Dr. Schott has generalized the results of all expeditions up to date, although in some respects it might perhaps have been made more complete, specially as regards the configuration of the land areas. It certainly would have been an advantage if the mountain ranges and peaks, with their heights, had been given. It might have been well, also, to have distinguished the land of which the existence is doubtful by a dotted line, as it is, the whole of Wilkes' supposed lands, some of which are extremely problemmatic, are shown as definitely as the discoveries which have been authenticated. However, as regards the south polar ocean, it is a most valuable chart, and, in addition to the bathymetrical tinting, numerous soundings are given, whilst the temperature of the water at many of the soundings is shown in red figures. The chart is accompanied by text giving a most useful summary by Dr Schott.

GENERAL.

British Empire. **Robertson and Bartholomew.**

Historical and Modern Atlas of the British Empire, specially prepared for students By C. Grant Robertson, M.A., and J. G. Bartholomew, F.R.S.E., F.R.G.S. London: Methuen & Co., [1905]. *Price 4s. 6d. net. Presented by the Publisher.*

In this atlas the editors have brought together a series of sixty-four historical, geographical, and physical maps and diagrams which will enable the student to follow the gradual development and expansion of the British Empire to the present time. The modern physical and economic maps will, it is hoped, provide the necessary illustration for geographical text-books; the historical maps in particular are intended to illustrate the whole course of British history from the point of view of imperial development, and the two together to prepare for an examination of the deeper and more complicated problems in government, in politics, and economics. The atlas was originally planned in concert with Mr. Hereford B. George, whose 'Historical Geography of the British Empire' will be found a most useful text-book for explaining the growth and structure of the empire, which the atlas is intended to illustrate. Some of the maps are quite new, whilst others are familiar as having appeared in previous atlases by Messrs. Bartholomew. There are two diagrams which are specially instructive—that showing the trade of the United Kingdom, and one at the end of the atlas showing the chronology and expansion of the British Empire.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during September and October, 1905. *Presented by the Hydrographer, Admiralty.*

No.	Inches.	
3510 m =	6·9	Scotland, west coast:—Inverie bay and approach. 2*s*. 6*d*.
3509 m =	1·0	Germany:—Mouths of the Ems. 2*s*. 6*d*.
3446 m =	0·7	Mediterranean, Ægean sea:—Paspargo islet to Samos strait. 2*s*. 6*d*.
3512 m =	7·3	West Indies. Cuba, north coast:—Bahia Honda. 2*s*. 6*d*.
3528 m =	7·3	Chile:—Port Lebu. 1*s*. 6*d*.
3539 m =	6·0	Central America, west coast:—Brito road. 1*s*. 6*d*.
3520 m =	6·0	British Columbia. Vancouver island:—Active pass. 1*s*. 6*d*.
3530 m =	6·9	Gulf of Aden:—Berbera. 1*s*. 6*d*.
3508 m =	1·7	Bay of Bengal:—Mayu river. 2*s*. 6*d*.
3518 m =	1·0	Bay of Bengal:—Bentinck sound. 1*s*. 6*d*.
3525 m =	9·0	Borneo island, west coast:—Jesselton harbour. 1*s*. 6*d*.
1220 m =	5·0	China sea. Borneo island:—Mitford harbour. 1*s*. 6*d*.

No.	Inches	
3515 m	= 2·43	Philippine islands. Luzon island :—Santa Cruz harbour. 1s. 6d.
3474 m	= 2·0	China, east coast :—Mirs bay. 2s. 6d.
372 m	= 0·77	Japan :—Kagosima Kaiwan. Plans :—Sakura sima seto. Hamanoichi road. Makurazaki wan. Odomari wan. 2s. 6d.
3514 m	= 2·0	Japan. Kiusiu, north coast :—Karatsu wan. 1s. 6d.
3507 m	= 4·0	Japan :—Mororan ko. 1s. 6d.
2672 m	= 3·6	Japan :—Hakodate ko. 1s. 6d.
3154 m	= 1·12	Japan. Ominase to Gogo shima. 3s. 6d.
3531 m	= 6·9	Tasmania, west coast :—Entrance to Macquarie harbour. 1s. 6d.
3519 m	= 2·8 4·7	New Britain, etc. Duke of York group. Miako harbour 2s 6d
3500 m	= 0·7	New Zealand. North island, east coast :—Cape Runaway to Gable end Foreland. 2s 6d.
179 m	= 0·23 1·73	New Hebrides :—Espiritu Santo island Turtle and Pallikulo bays and approaches. 1s. 6d.
1923a		British Columbia. Cape Caution to port Simpson, etc. Plan added :—Kemano bay.
3145		Bay of Bengal Andaman islands. Plan added :—Eastern entrance to the Andaman or Middle strait.
55		New Britain, anchorages in. New plan :—Unter Kamboira.
1416		New Guinea. Anchorages on the north-west coast. New plan.—Fak Fak and Acha Tuning roads.
1101		Pacific ocean Mariana or Ladrone islands. New plan—Guam or Guajan island.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1893	Sighajik bay to Gulf of Skala Nuova	New Chart. Paspargo islet to Samos strait	3446
1527	Gulf of Skala Nuova		
411	Bahia Honda. Plan on this sheet.	New plan. Bahia Honda	3512
1286	River Lebu Plan on this chart.	New plan. Port Lebu	3528
919	Berbera. Plan on this sheet.	New plan Berbera	3530
835	Bentinck sound. Plan on this sheet.	New plan Bentinck sound	3518
838	Andaman strait	New plan. Eastern entrance to the Andaman strait	3145
2111	Gaya harbour. Plan on this chart.	New plan. Jesselton harbour	3525
1220	Mitford harbour.	New plan. Mitford harbour	1220
372	Gulf of Kagosima, upper part.	New chart. Kagosima kaiwan and plans	372
993	Mororan or Endermo harbour Plan on this sheet.	New plan Mororan ko	3507
2672	Hakodate harbour.	New plan. Hakodate ko	2672
764	Duke of York group. Port Hunter. Plans on this sheet.	New plans. Duke of York group, Miako harbour	3519
55	Weber bay. Plan on this sheet.	New plan. Unter Kamboira	55
179	Approaches to Pallikulo bay.	Espiritu Santo island. Turtle and Pallikulo bays and approaches	179

(*J. D. Potter, Agent.*)

Charts that have received Important Corrections.

No. 1446, Scotland, east coast:—Aberdeen. 1121, Norway:—Bergen 2369, Germany, north coast. Sheet V.:—Rischöft to Brüster ört. 77, Spain, north and west coast:—

Bay of Gijon. 2231, Black Sea, Sheet II.:—Cape Kaliakra to Odessa. 3335, Labrador:—Approach to strait of Belle isle. 779, Labrador:—Belle isle strait. 282, Newfoundland:—St. John bay to Orange bay. 284, Newfoundland:—Cow head harbour to St. Geneviève bay. 266, East coast of United States:—Great Egg harbour to Albemarle sound. 1296, Chile:—Plans on the coast of. 2839, United States, west coast:—Columbia river. 2111, Borneo island, Sheet VII.:—Nosong point to Ambong bay. 2636, Philippine islands:—Strait of Makassar, north part. 1760, China:—The Brothers to Ockseu islands. 2409, China, east coast.—West coast of Formosa, etc. 582, Japan:—Simonoseki strait. 132, Japan:—Channels between Nisima Nada and Bingo Nada. 2411, New Zealand.—Otago harbour. 1103, Pacific ocean:—Palao or Pelew islands, etc. 980, Pacific ocean:—Caroline islands. 2169, Pacific ocean:—Islands in the North Pacific.

Chile **Chilian Hydrographic Office**

Chilian Hydrographic Chart. No. (Provisional) 123. Canales en el seno Última Esperanza. Valparaiso: Oficina Hidrografica, Marine de Chile, 1905 *Presented by the Chilian Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for December, 1905. London: Meteorological Office, 1905. *Price 6d. Presented by the Meteorological Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for December, 1905. Washington. U.S. Hydrographic Office, 1905. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Algeria. **Hilton-Simpson.**

Eighty-eight photographs of Algeria, taken by M. Hilton-Simpson, Esq. *Presented by M. Hilton-Simpson, Esq.*

A most interesting set of photographs of Southern Algeria and the Algerian Sahara. The subjects are typical and well chosen. The panoramas, of which there are many, are exceptionally good, and all are carefully described by Mr. Hilton-Simpson, which adds considerably to their value.

(1) A side of the market at Biskra; (2) Royal Hotel, Biskra; (3) An Uled Näil dancing girl; (4) Typical view of the scenery near the railway between El Guerrah and Biskra; (5) View of the Col de Sfa; (6) Arab and Negro children, Sidi Okba, (7) Interior of the "fonduk" or camel yard near the live-stock market, Biskra; (8) The market-place, Sidi Okba; (9) Sidi Okba; (10) Hotel Dar Diaf and Casino, Biskra, (11) Looking southward up the valley of Wed Marsa; (12) Shelter used as a summer residence by Kabyles above Wed Marsa; (13) Cap Carbon, Wed Marsa; (14) A group of Kabyles near Wed Marsa; (15) The Hotel de Roulage, Wed Marsa; (16) Kabyle children, Wed Marsa; (17) The Valley of Wed Marsa; (18) Group of Kabyles at Wed Marsa; (19) Bey of Bou-Saada; (20) Caravan leaving the market at Sidi Aissa; (21) The Aumale to Bou-Saada coach; (22) The coach from Buira to Aumale; (23) Arrival of the Sub-prefect of Setif at M'Sila; (24) An Arab street, M'Sila; (25) Kaid's horse; (26) An old well at Duar Saidat near M'Sila; (27) The square, M'Sila; (28) Bordj, Chellal; (29) Road-making at Baniu; (30) Sorting snuff tobacco at M'Sila; (31) French well in the desert near M'Sila; (32–34) Ouled Nail dancers of M'Sila; (35) View in the part of the Plateaux des Shotts known as the Petit Sahara; (36) The Wed M'Sila; (37) Square in the European and mercantile town, M'Sila; (38) General view of M'Sila; (39 and 40) The market place, M'Sila; (41) Monument to the victims of the massacre of 1871, Palestro; (42) Road entering a tunnel, Palestro; (43) Cascade in the gorge of Palestro; (44) In the gorge of Palestro; (45) The entrance to the gorge of Palestro; (46, 47, 49, and 50) The Gorge of Palestro, looking northward; (48) The gorge of Palestro, looking southward; (51) The pool, Roumana Gueblia; (52) Tents of the semi-nomadic tribe Hauamed; (53) Native ponies in the yard behind an Arab House at Rumana Gueblia; (54) Pitching a chief's tent opposite to mine at Rumana Gueblia; (55) "Drawing" for a hare in the Petit Sahara, near Rumana Guebla; (56) Fertile bed of a stream at Rumana Gueblia; (57) Belcassem ben Zumi, brother of the Kaid of Rumana; (58) Boy making a shoe of halfa grass, Rumana Gueblia; (59) Tent of the Hauamed tribe; (60) Two "sloughis" or native hounds; (61) Dry bed of a stream near Rumana Gueblia; (62) The servants shaving each other's heads at Rumana Gueblia; (63) My camel-driver going from Rumana to

Bu-Saada; (64) Kadur ben El Haj, eldest son of the Kaid of Rumana; (65) In the Petit Sahara; (66) House lent to me at Rumana Gueblia; (67) The gardens in the oasis of Rumana Gueblia; (68) Our camp; (69) General view of Rumana Gueblia; (70) A general view of the Petit Sahara; (71 and 72) In the market of the Beni-Menguellet tribe; (73) An extemporized *café* in the market of the Beni-Menguellet; (74 and 75) Market of the Beni-Menguellet tribe of Grande Kabylie; (76) The Jurjura chain from Michelet; (77 and 79) Kabyle village near Michelet; (78) Street in a Kabyle village near Michelet; (80) The native quarter of Jizi-Uzu; (81) The diligence which runs from Fort National to Fizi-Uzu; (82) An old Kabyle near Michelet; (83) A small market near Michelet; (84) Kabyle children near Michelet; (85) View looking towards Michelet, (86) A view of the Jurjura chain in Grande Kabylie; (87) Fizi-Uzu; (88) Hills to the north of Michelet.

Bolivia and Peru. **Petrocokino.**

Fifty-nine photographs of Bolivia and Peru, taken by A. Petrocokino, Esq. *Presented by A. Petrocokino, Esq.*

These photographs form a welcome addition to the Society's collection. The views of Cuzco and neighbourhood are specially interesting.

Bolivia.—(1–3) Market-place, Oruro; (4) A square in Oruro; (5) Old church, Oruro; (6) Post near Oruro; (7) Village of Challas; (8) View from Challas; (9) Village of Parotani near Cochabamba; (10) Llamas on the Bolivian pampas; (11) Village of Quilloguolla; (12) Market-place, Quilloguolla; (13) Avenue leading into Cochabamba; (14) Adobe telegraph post; (15) The plaza, Cochabamba; (16) Cathedral, Cochabamba; (17) Adobe church near Argue; (18) Old Inca houses near Caracoles; (19) View of La Paz; (20) Inside view of La Paz; (21) Lake Titicaca from Chilelaya; (22) Lake Titicaca; (23) Balsa on Lake Titicaca; (24) End of Lake Titicaca; (25) Indians near borax lake of Carcoti.

Peru.—(1) Balsa on Lake Titicaca; (2) View of Puno, with Lake Titicaca in the distance; (3) Cathedral and market-place, Puno; (4) Indian funeral in village near Urcos; (5) Cathedral, Cuzco; (6) Jesuit church and the University, Cuzco; (7) Fountain near cathedral, Cuzco; (8) Sacsahuaman, the citadel, Cuzco; (9 and 11) Old Inca walls at Cuzco; (10) The "Inca's seat," with ruined Inca walls, Cuzco; (12) Cuzco from Sacsahuaman; (13) Market-place from the cathedral, Cuzco, (14) View of Cuzco from the top of Sacsahuaman; (15) Old Spanish house with Inca foundations, Cuzco; (16) Llamas in Cuzco; (17) Plain of Ayacucho; (18) Between Abancay and Andahuaylas; (19) Bridge over gorge of Rio de Pampas; (20) At Urubamba; (21) Between Huancarama and Andahuaylas; (22) Fortress of Ollantaytambo; (23 and 25) Citadel of Ollantaytambo; (24) Ollantaytambo; (26) Stones on top of citadel of Ollantaytambo; (27) View from citadel of Ollantaytambo, with two ruined Inca "palaces" on side of mountain; (28) Upper terrace on citadel of Ollantaytambo; (29) Large monolith on citadel of Ollantaytambo; (30) Suspension bridge near Acobamba; (31) Suspension bridge at Pissac; (32) View near Chincheros; (33) Village of Curuhuasi; (34) Bridge over river Angayacu.

Congo State. ——

Ten photographs of the Upper Congo Railway. *Presented by Compagnie des Chemins de Fer du Congo Supérieur aux grands Lacs Africains.*

A set of mounted platinotype enlargements.

(1) Building workshop; (2) Timber bridge, kilom. 10: (3) Unloading a steamer at Stanleyville; (4) Wharf and steamer at Stanleyville; (5) Bridge, kilom. 10; (6) The line near Stanleyville; (7) Stanleyville station; (8) Digging a trench near Stanleyville; (9) Bridge, kilom. 20; (10) A crossing near Stanleyville.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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FIRST EXPLORATION OF THE HOH LUMBA AND SOSBON GLACIERS.*

TWO PIONEER ASCENTS IN THE HIMALAYA

By FANNY BULLOCK WORKMAN, F.R.S.G.S., Officier de l'Instruction Publique de France.

A YEAR ago Dr. Hunter Workman read a paper before this Society relating to the Chogo Lungma glacier. The paper to-night describes our exploration of the Hoh Lumba and Sosbon glaciers, and mountaineering experiences on the Chogo Lungma not touched upon by him.

The bases of our two last expeditions in Baltistan, North-West Himàlaya, are reached in twenty-three marches from Srinagar, the capital of Kashmir. This region, the glaciers of which were explored by us, lies between 74° 55′ to 75° 45′ E. long. and 35° 45′ to 36° N. lat.

During the second season a first ascent and investigation of the Hoh Lumba and Sosbon glaciers were made.

From Skardu, the chief village of Baltistan, a march north-east brings one to the Shigar valley, which is traversed in 20 miles to its junction with the Braldoh and Basha rivers. Here for 14 miles the Braldoh valley is followed to the small village of Hoh, which lies above the junction of the Hoh and Braldoh rivers at 9400 feet. Here, on June 19, our caravan was reinforced by Hoh coolies, and added to these were camp servants and a Hoh Lumbardar, making a total of seventy men. Accompanying Dr. Workman and myself were Mr. B. Hewitt, topographer, and the well-known Italian guides, Joseph Petigax and C. Savoie, of Courmayeur, and L. Petigax, porter.

The narrow Hoh ravine, or *nala*, runs north, and is ascended along the precipitous cliffs of nude mountains. It is filled by old glacial *débris* several hundreds of feet deep, containing boulders of all sizes, some extremely large. At the bottom of this desolate ravine the Hoh

* Read at the Royal Geographical Society, November 20, 1905. Map, p. 224.

river, a rushing khaki-coloured glacial stream, descends, cutting its way often at a great depth.

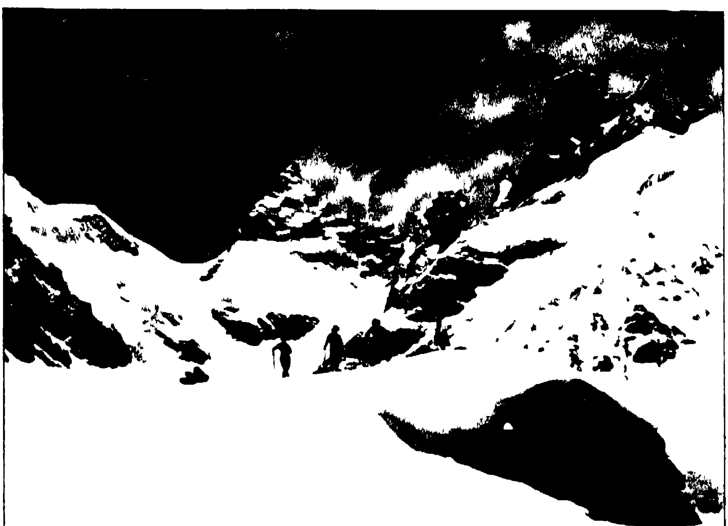
We ascended over the boulder-composed slopes. Beyond this an enormous winter avalanche strewn with black detritus, reaching from one side of the nala to the other and completely covering the river, was crossed. No vegetation, except the hardy aromatic burtsa plant, is met with until Pirnar Tapsa, a small grazing-ground, is reached, about 4 miles up. This is fairly well covered with birches and cedars. Two miles further is Nangma Tapsa, a similar grazing-spot at 11,595 feet, where we camped. To this point, with the exception of Pirna Tapsa, our narrow broken trail ascended through a grim lifeless landscape without a note of colour. Some call Ladakh routes dull and monotonous, but to me that land is one of ever-changing beauty and picturesqueness compared to the vale of Hoh Lumba, held as it is in the grip of the acme of desolation. But at Nangma Tapsa all is changed, and our caravan spreads itself and its tents over a wide green maidan sprinkled with trees, where cows graze and drink at musical rivulets. Sportsmen sometimes come here in search of ibex, which are found on the mountain flanks bordering the lower part of the glacier.

Colonel Godwin-Austen saw the glacier from a distance when surveying for the Government of India, but our party was the first to ascend it. Its general direction from Nangma Tapsa is north-west. Its length from the snout to its source under the great col is 12 miles. Its greatest width is a mile, and its width at upper end below the source half a mile. It seems to have retreated somewhat rapidly of late years. Above Nangma Tapsa is a large old moraine strewn with large blocks and covered with trees. The furthest point of this is about a mile in front of the present glacier. Then comes a marked division where the moraine matter is much smaller, there are no large blocks, and a scarcity of vegetation is observed. At this part, near the oldest piece, is some small scrub, but this ceases about half a mile from the glacier, and the moraine has a generally new appearance.

As you look down from the glacier, the river is seen to have cut its way between the hill and the moraine on the left. No signs of glaciation on the hill beside the stream were noticed, but the rock is weathered and easily split, and striation marks would have been long since effaced. Another sign of retreat is the presence of an important moraine ridge, the highest point of which is 50 feet above the glacier. On the free side it rises fully 100 feet. It is passed over in reaching the ice as one ascends from Nangma Tapsa. At the top of the ridge is a huge boulder, the form and dimensions of which are represented by a cube with a side of 50 feet, which shows how much greater volume the glacier must formerly have had to deposit such a mass of rock in this position.

At the top of the high ridge looking east is seen the first left

Nangma [illegible] and the huge terminal moraine of the Hoh Lumba forming a large hill about 500 feet high; its age is indicated by the tree growth covering its surface.



Upper End of the Hoh Lumba and Col des Aiguilles

branch of the Hoh, the Chaltora. The only other branch on the left or east side enters 4 miles from the snout, and is called the Sosbon. On the west side three feeders enter the main stream near the southern end, and 6 miles up another large branch debouches to the west. Altogether there are six tributaries. June is supposed to be a good month for glacier exploration in the Himálaya, but this season it was not, owing to the late severe winter storms.

Leaving the ridge, we were at once on the ice at about 13,500 feet, at which height on other glaciers we have always found either lower mountain spurs or lateral moraines on which to camp. But this season, at the end of June, we found the Hoh Lumba covered completely with

ASCENDING OVER THE SNOW HILLOCKS OF THE HOH LUMBA

a deep mantle of snow, equally so the lower mountain flanks. Our first camp on the glacier being near a glacial water pool, it was not necessary to melt snow for water. All water-buckets were speedily filled, however, lest the reservoir should freeze over in the lowering temperature. The coolies' tents here proved insufficient for the number of men, and I was obliged to give them one of my small Mummerys, which I did with keen misgiving, knowing that for our own use it would not again be available. Owing to the deep snow-covering before mentioned, it was most difficult to judge of the conformation of the glacier or of its moraines. On the glacier itself lateral moraines were slight or wanting, and medial moraines, if

there were any, were so covered with snow that they could not be distinguished.

The snowy surface is well seen in the photograph, as are the wavy undulations characteristic of the first 5 miles. One climbs up and down over great snow-hillocks for long stretches. We are here above our first glacier camp of 14,600 feet, the splendid granite peaks in the background appearing foreshortened by this rising terrain. They represent the general mountain forms seen on the Hoh Lumba, and are the peaks bordering the west bank leading to the col. Those on the east bank are scarcely less serrated and abrupt in character. To intrude an Alpinist's view, I will say that, while the scenery is of the utmost beauty on this glacier, the mountains bordering it are mostly quite unclimbable.

The fourth and last branch on the west side is 3 miles long, and where it enters the Hoh Lumba not lower than 15,000 feet. Its face has an unbroken, deep snow surface, no crevasses even being visible. South of this nala, about 5½ miles up the glacier, observations were made of the movement of the Hoh stream. Observing the movement at the time we were there was very difficult, owing to the masses of surface snow and the constant rain of avalanches from the steep slopes forming the sides of the glacier In fact only one practicable point for doing it was found on the west bank, where the inclination was about 2° 32′ from the horizontal. At 446 feet from the bank the movement in twenty-four hours was $\frac{26}{100}$ of a foot; at 734 feet distance it was $\frac{20}{100}$ of a foot. On the Chogo Lungma glacier, later explored, the season being more advanced, we found more satisfactory conditions for this sort of work, and had better results.

After leaving this branch to the left as we ascend, the main glacier bends more to the north, opening into what has the appearance of a large elongated basin, and from the snow-covered rock the great saddle above the source, 3 miles off, is seen. This depression is the only one in a vast cirque of granite aiguilles stretching in two long lines from both sides of the ridge. These peaks range from 19,000 to 20,000 feet in height, and their great knife and sword-like forms, at that early season dashed with new snow wherever it could lodge, presented one of the most impressive and bizarre mountain scenes I have met with. This ice-fall, for it is not a pass, is indicated on the Indian Survey map as a low pass leading over to the Hispar glacier. As a matter of fact, the ridge over the *séracs* ends in a huge curling cornice, which overlooks a glacier, not the Hispar, passing about 4000 feet sheer below the cornice. This saddle, first ascended by us on June 23, is 18,331 feet high. At the end of the glacier the visible width of the ice-fall is 624 feet, and the height of the lower sharp fall 324 feet. The ascent was somewhat difficult, as one must climb quite to the right of the ice-fall and traverse the steep snow slope of the rock aiguille.

Our camp at 15,780 feet was near the source of the Hoh glacier. Here two nights had to be passed in order to reach the great col, and it was an inhospitable place to put up in, not a rock in sight, only the great snow expanse stretching below, and the stern pitiless sentinels watching above. While waiting for the coolies to come up at 1.30 we took a sun temperature, 170° Fahr.; not one of our highest, but the day was windless and the heat concentrated and enervating. The sun left the camp at 4 p.m., and by five it was freezing, a strange contrast to 170° in the sun three hours before.

Four of our party are seen in the photograph on the Col des Aiguilles, or Needle ridge as we named it, this side of the great

ON THE COL DES AIGUILLES, 18,600 FEET, IN WHICH THE HOH LUMBA ORIGINATES.

cornice. The broken *arête* of the peak to the left of the col was a magnificent spectacle on that clear, cold, windy day. A second more perpendicular peak rises beyond the first. Stepping out upon the cornice, the mountains bordering the intervening glacier, I before spoke of as not having been supposed to exist, were photographed. The view from here was of much interest to us, as it settled the question in the negative of there being a direct passage from the Hoh Lumba to the Hispar glacier. I will not indulge in the usual platitude that "the scenery was magnificent," but merely say that had you been with me on Needle ridge that day, you probably would have enjoyed, as much

as I did, the newly discovered geographical features and the sublime prospect.

I will now draw your attention for a moment to the large east branch of the Hoh Lumba, called the Sosbon. On the Indian Trigonometrical Survey map it is drawn as a small branch of the Hoh. It enters the main glacier at about 4 miles up, and is in reality a glacier nearly as long and quite as wide as the Hoh. It is 7 miles long from its junction with the former to its source at the base of a saddle 17,000 feet high, and its course is approximately parallel with the Hoh. It is fed by several tributaries and hanging glaciers on its east bank.

Our camp on it at 15,019 feet is seen in the photograph, and the great peak of over 22,000 feet peering out of the clouds we called Mt. Sosbon. Among peaks, as among people, now and then one runs on a "striking personality," and this mountain, like the great Pyramid Peak which dominates the Chogo Lungma glacier at a dozen points, was the striking personality of this glacier. From above, from below, wherever seen, it always caught the eye and held it. It was here at the beginning of a snowstorm that our permanent corps of coolies left. As the snow accumulated foot after foot about the tents, there seemed little hope of our being able to move should the weather turn fair. Luckily, we had foreseen this action on the part of the coolies, and sent to Askole some days before for more men, who in due time came up the glacier After the forty-eight hours' snowstorm we were treated to here, all possible knowledge of the glacier's structure had to be gained by plodding about in snow to the knees.

Three well-defined deep ridges follow the sweep of the glacier from the base of the Mount Sosbon for 2½ miles down to about the entrance of the first east feeder, and we distinguished one strongly marked medial moraine ridge. Below this the glacier is evidently covered with moraine detritus, but it was so coated with deep snow that little detail was observable.

This tall gneissoid rock, seen in illustration, stands in the middle of the glacier not far from the camp, and is 25 feet high. The top is split into five tall pieces. Being in the centre of the glacier, it could not have fallen from the side peaks, but must have descended with the glacier from some peak near its source 4 miles distant; it is the more curious that it should have remained standing without splitting further through an unknown period of time. The splendid riven snow-coated rock towers are typical of the border scenery of these two beautiful ice-streams.

I have a few words to say in regard to the Karakorum watershed, on the south side of the Hispar glacier. In our last two expeditions we have, I might say, attacked it repeatedly, partly because the cols and passes culminating the glaciers we were investigating found their source in it, and partly because we had a hobby for finding a new pass,

over which a caravan could be taken to Hispar. I am now of the opinion that the only available coolie route from either side is the Nushik La.

The Sosbon and Hoh Lumba glacier cols are separated from the Hispar pass only by a small intervening glacier and narrow ridge. Of these cols one is a huge overhanging cornice, the other drops in a precipice towards Hispar. Next beyond the Hispar pass, following the range, comes the Alchori col, of which I made the first ascent with three guides. It is 17,622 feet high, and is another great snow-cornice directly overtopping the Hispar glacier. We did not dare stand on the cornice to be photographed. But roped we did crawl up there singly and look down at the great Hispar winding its lonely course toward Nagar. I also took a photograph of two north arms of the Hispar, one of which is marked Kanibasar on the survey sheet. On this map the top of the Alchori runs to the east, and is separated from the Hispar by a branch, whereas it really runs due north.

I only wonder that in these details the survey maps are as correct as they are, considering how little the surveyors really saw of the higher parts of these glaciers. Here again we were disappointed, for it was not only impossible to take a caravan, but we could not take ourselves over to Hispar. Next come two good-sized north feeders of the Alchori, which find their source in a line with the Alchori col and overhang the Hispar, but after careful reconnaissance we found these so shattered and riven by ice-falls and great crevasses near their summits as to make them inaccessible even from the south side. From the Kero Lungma, two branches which might lead to the Hispar were found untraversable at their heads.

Then comes the Nushik La, a practicable pass, but which of late years the Basha coolies are unwilling to cross. From the Chogo Lungma upper tributaries we have ascended two very high cols, which proved quite out of the question as passages. Above the great wall at the head of the Chogo Lungma, named by us the Pertab Singh La, which rises to 19,800 feet, there is, we think, a fairly good route to Nagar, as we had an excellent view of the snow-valley and glacier falling beyond it, but to impress loaded coolies up the wall of 800 feet at over 19,000 feet would be the difficulty.

We have thus either climbed or thoroughly examined eight depressions in the mountains forming the south border of the Hispar, and found them with one exception inaccessible from the Hispar or north side. These observations show very fully that in this region of the Karakorum, the northern slopes are more precipitous and less accessible than the southern.

I will now speak briefly of two high ascents, made from our base camp on the Chogo Lungma glacier the same season.

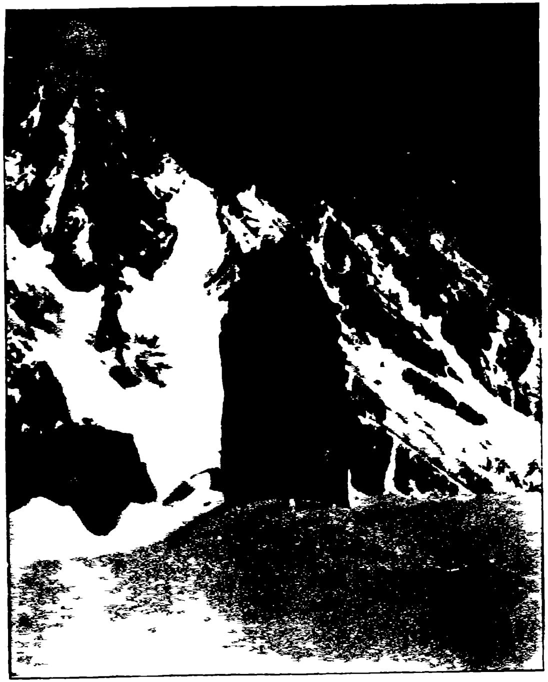
The climbing of a snow-peak of over 20,000 feet in the Chogo Lungma

region is attended with more difficulties than the ascent of a similar height in Ladakh, or the Andes. First, transport must be taken several marches over a long complex glacier such as does not exist in South America, and can only be compared in size with those of Alaska. Secondly, the permanent snow-line here is much lower. We placed it on the Chogo Lungma at about 16,000 feet. This obviously adds much to the difficulty of making high ascents, as several snow-camps must be made, and with each successive high camp the courage of your transport coolie diminishes. The uncertain weather conditions, due to the Indian south-west monsoon during the two climbing months of July and August, present another serious obstacle. Some seasons, as was our experience in 1902, one does not run upon more than two clear days consecutively, and then no very high ascents are possible. In 1903, after long periods of storm, five fine days occurred, and we seized the opportunity.

The Asiatic Riffelhorn was so named by us because of its resemblance to the Zermatt peak of that name. It is 22 miles up the Chogo Lungma glacier, and is 15,397 feet high. On the summit is a stone cairn built by us, which contains some of the accounts of our different snow-trips made from this base.

Riffel camp at 14,000 feet on the flank of the Riffelhorn was our base for sixty days during two seasons. Its situation in the heart of the Arctic Chogo Lungma scenery was truly magnificent, and much interesting work was carried out from here which I cannot even touch upon in this paper. The mountains we had in view lay to the north-east of this camp, and were two of several snow-peaks separating the upper Chogo Lungma from one of its high east tributaries, which we called Basin glacier. On August 9, taking only twenty of the strongest coolies from the permanent corps of sixty, and light camping-kit, accompanied by the Italian guides, we crossed the Chogo Lungma to the entrance to Basin glacier. It tumbles into the main stream in a fine séracked, inaccessible ice-fall. Crossing the mountain spur, we ascended for some hours over steep beds of *névé*, between the mountain flanks and the ice-fall.

Above the ice-fall the glacier was smoother, but heavily seamed by treacherous crevasses covered with deep surface snow from the recent storms, which made marching difficult for the coolies after 6 a.m. By 3 p.m. we were camped 16,352 feet under the wall where our route for the next day lay. Luckily for the caravan, thus far water could be had from clear, delicious glacial pools, which had formed near by on the glacier. Starting early the following morning, the guide led the way directly up. The steepness diminished after a time, and the line moved fairly well so long as the surface remained hard. All the slopes were much broken, and we had to make *détours* to avoid great chasms and crevasses. The two peaks we had in view are seen in the photograph.



Gneiss i Rock 25 f t high i h middle f the
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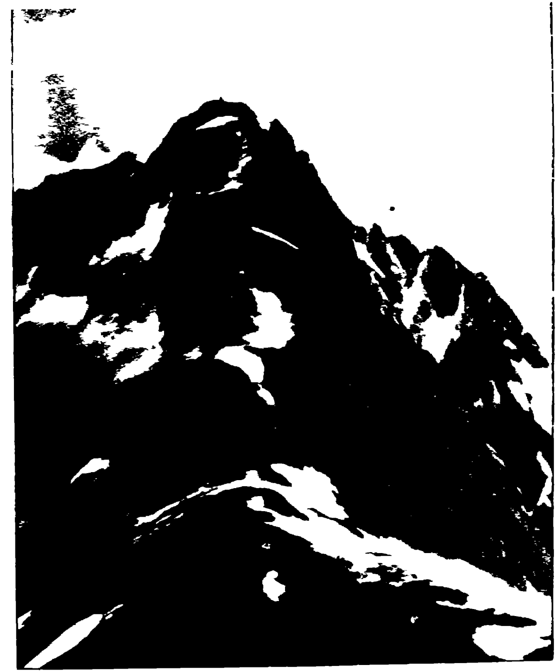

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From their position and manner of receding from the glacier, we were never able to photograph them quite satisfactorily. Soon after eight o'clock a snow-ledge, overhung by a huge schrund, fringed with massive icicles ranging from 8 to 15 feet in height, was reached.

We stopped here for some refreshment, having already climbed about 1500 feet. The view was becoming very extended and grand, and was particularly fine of the Bayakara col ("pass perilous,") first ascended and named by us the previous season. Its height is 19,260 feet, and was called by Zurbriggen, then our guide, the most difficult col he had made in any land. It took us six hours to cut our way up, and when the top was reached we stood on a narrow splintered ridge, with precipices of about 2000 feet on either side. The descent was negotiated by treading backwards. To return to our present mountain, I can only hint at the incidents of the journey to the second camp; of how the coolies complained and floundered in the soft snow to above their knees; the leaving of the second guide to help them, while we others went ahead digging out deep steps up steep *arêtes* and broken snow-slopes, until at noon we brought the discouraged caravan to a place where a camp was pitched at 18,810 feet.

Our solar radiating thermometer registered here, 1 p.m., 192° Fahr.; in the shade the temperature was 55°. Toward night thick mist floated in and wild snow-flurries shook our small tents. In spite of this our third day at snowy heights broke clear and cold, the tall silvery peak, still far above, calling loudly to us in the grey blue dawn. A long ridge seamed with crevasses took several hours to negotiate, for getting the head coolie over a yawning crevasse was onerous work. Later on Dr. Workman and the second guide remained with the men, to entice and help them on, while Petigax, the porter, and I tracked out a way some distance in advance. The head guide was cutting steps up a high wall in zigzag, for we much wished to take the coolies up this and over a shoulder running above, and then find a flat place for camp. But, alas! a call of warning rang from below, and, turning to look down, we saw many of the coolies lying on their backs on the snow. The report came that some were mountain-sick, and the others refused to move.

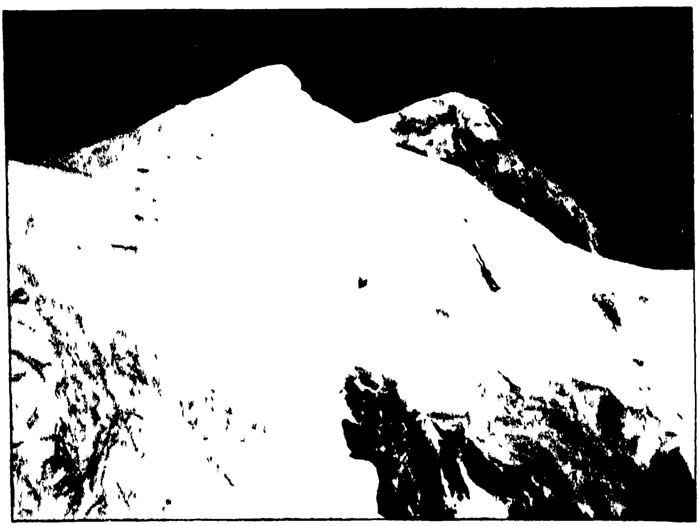
After much conference and various attempts, including offers of money, to make the coolies advance, we returned to the scene of action, or rather inaction. As they remained obdurate, we led them groaning down a few hundred feet, and, taking a different course, steered for a plateau on another side of the main mountain; here we camped at 19,358 feet.

It was clear the coolies could be taken no higher. They even told us they must stay here a few days to recuperate. The peak was still far above, but the only way was to attack it early the next day ourselves, and hope for success. The guides went out after it froze, and

cut steps for a long way to facilitate the coming ascent. The black-bulb thermometer registered 180° Fahr. in the sun, and 38° was the shade temperature at 2 p.m. at this high camp.

Having completed the hypsometric and other observations, the rest of the day passed quickly in preparation for the ascent, and in cooking dinner over a primus stove. After that sleep was sought in our sleeping-bags, but the night was not a restful one at that height, and all suffered from wakefulness and want of oxygen.

At 3 a.m. on the fourth day we left the tents by moonlight, temperature 15° Fahr., and, roped, crossed to the base of the peak, attacking the sharp slants in zigzags. We made much quicker progress than



MOUNT CHOGO, 21,500 FEET, AND MOUNT LUNGMA, 22,568 FEET, TAKEN FROM AN ALTITUDE OF 17,000 FEET

usual at such heights, because of the steps cut the night before, but the gradient was very steep, broken by no mitigating plateau, and rising, as measured by clinometer, at an angle of 60° and over, until near the summit. The cold was most severe before sunrise, and chiefly affected our feet. As we neared the top, they were so delightfully sensationless that we considered taking off our boots and stockings and rubbing them with snow, but vigorous pounding with ice-axes at last produced the necessary tingling that meant safety. As we went higher, an army of peaks seemed to steal up around us in the waning moonlight. Shadowy at first, they soon stood clear and ghastly, as if marshalled to meet the sun. Then came the glorious after-dawn light of India, a

golden red from the horizon creeping upward till the zenith was shot with blood-red fangs. Next King Sol burst upon the scene, flinging his rays first aslant one summit and then another, flooding the whole snowy world with light and colour. Feeling the lassitude unavoidable at such a height, we were marching slowly up the last zigzag, and at 7.15 stood on the corniced summit, 21,500 feet above sea-level. Through an error in copying the figures, the height of this peak was first given out as 21,770 instead of 21,500 feet.

The day was cloudless and the view widespread, ranging to the south over Masherbrum, Gusherbrum, the Mustagh Tower, and hundreds of scarcely lesser heights, until the eye was caught by a great dark pyramid hung above a bank of vapour, seemingly in mid-air. This was K_2, or Chogori, mighty in its *rôle* of second to Everest, and a warning to would-be climbers. Westward came the *massif* of Nanga Parbat and the snowy form of Haramosh, 24,270 feet, which looks like the head and spread wings of a dove. But they were all too far away to be photographed, and we had to content ourselves with recognizing and picking them out. The temperature was 16° Fahr.—certainly not cold for the height and after photographing and taking observations, we turned our attention to another peak lying beyond, to the north. It rose, apparently, about 1000 feet above, from an elevated plateau, and was separated from our peak by a long ridge.

It was early in the day, and although we gasped a good deal after oxygen on moving, we were fit enough as a whole, and why not that peak too? This is the second peak or Mount Lungma. Gathering up our ice-axes and adjusting the rope, we descended several hundred feet to the ridge. Crossing this, in places heavily crevassed, the plateau was reached, and soon the ascent of the long slopes was in order.

The gradient we were now on was much less steep than that of the first peak, a consoling feature at 22,000 feet, and in three hours we stood on the summit of Mount Lungma, a snow-slant on the east side, and an overhanging cornice on the north-west.

The view was similar to that of the first peak, except that the distant mountains appeared higher, and we looked down a good deal on the previous summit. Still less oxygen was in the air, and with slower motions we set about taking our observations and readings, which, after calculation and comparison with lower station readings, placed the height at 22,568 feet. I had thus broken my old record of 21,000 feet twice on the same day, and this time by 1568 feet.

The temperature became really warm towards noon, and we were able to discard all coats, and at 2.30 before we went down it was 50° in the shade. Dr. Workman and the two guides made a still higher ascent from here on a third peak to an altitude of 23,394 feet. In going down, a peculiar view of peaks running in crested waves was taken. The snow conditions in ascending had been good as a whole,

but descending they were much more trying, causing us to sink in, after the first hour, to our knees. Soft snow is, in my opinion, one of the great obstacles to high climbing in the North-West Himalaya. It wears the strongest out after a few hours. The best way to avoid it is to start in the small hours, but even then a crisp, hard surface for an entire climb is, I believe, not to be expected.

Another night was spent at the high camp, and the fifth morning we packed tents and descended to the glacier. None too soon, as it happened, for the weather was changing to the bad. In regard to taking heights, it was our custom at all high camps, and, when any way possible, also on peaks and passes, to make hypsometric observa-

ON THE SUMMIT OF MOUNT LUNGMA, 22,568.

tions, which were compared later with lower-station mercurial barometer readings taken for us by a Government official three times daily at Skardu. Calculations were then made from these observations by three different tables, the average being accepted as the true height. We also carried two Watkin patent aneroids graduated to 25,000 feet, which were checked daily by the boiling-point.

As regards the effect of rarefied air at great altitudes, speaking for myself, I suffer considerably from mountain lassitude after 19,000 feet, particularly in climbing, but breathe well when in repose in sitting posture. At camp 19,355 feet I slept very little, never more than ten minutes without awakening. On our highest peak (22,568 feet), where I remained some hours, I had headache, felt uneasy, gasped a

good deal for breath, and was obliged to change position often, but experienced no nausea. I could eat kola biscuits and chocolate and a little meat, but had no great desire for solid food.

The Swiss guides who accompanied us in previous expeditions, and the three Italians who were with us on the last one, climbed well and acknowledged no inconvenience from altitude, even at 20,000 and 22,000 feet, although they said they slept less well at above 18,000 feet than at lower heights.

The Balti coolies do not stand altitude as well as Europeans. Some become ill and incapacitated at 14,000 and 15,000 feet, and many are quite used up with migraine and nausea at 18,000 feet. All our coolies were either sick or demoralized at 19,358 feet, so that it was useless to attempt taking them higher. Many climb well for a short time at high altitudes, but they are quite unfit to endure the strain, that we Europeans undergo, of from ten to fifteen hours' movement in making an ascent. Their constant unsubstantial diet of meal or rice has, without doubt, considerable effect upon their physical endurance.

So far as acclimatization is concerned, I believe in it to this extent—that the longer one has camped and lived at altitudes of from 14,000 to 17,000 feet, the better fit one will be to attack heights of over 21,000 feet. My own experience leads me to think that a prolonged stay at 18,000 or 19,000 feet rather unfits than prepares one for ascending very high peaks. The want of oxygen, the cold and incapacity to digest a sufficient quantity of nourishing food, have a weakening effect on some constitutions.

The Anglo-Austrian party who attempted K_2, certainly appear to have camped longer at great altitudes than any previous expedition, and they came, to judge from M Jacot Guillarmod's account, to a similar conclusion. Personally I do not agree with M. Guillarmod, that one loses strength and weight on a diet of tinned food for several weeks. I can thrive on a diet of good tinned meats and vegetables and Bovril rations for three or four weeks as well, if not better, than on the monotonous diet of emaciated chickens, eggs, and mutton which one obtains in the lower camps of 12,000 to 15,000 feet.

Before the paper, the PRESIDENT said: I now have the honour of introducing to you Mrs. Bullock Workman. I presume that every one here reads the *Journal* of our Society, and if so, you will have known that Mrs. Bullock Workman, together with her husband, Dr. Hunter Workman, has carried on explorations for years past in the Himalayas, and you may perhaps remember that a portion of those explorations was described in a paper here by Dr. Hunter Workman about a year ago. It is, therefore, a merely formal introduction of the lecturer I have to present to you. It is unnecessary I should stand in the way of the reading of the paper by saying anything of the excellent exploring work of Mrs. Bullock Workman; but it has been so unusual, so infrequent, for a lady to read a paper here that a few words on this subject will, I think, be appropriate to the occasion. In my time I can only remember one single instance—that of the late Mrs. Bishop. Possibly

I may be wrong; there may have been one or two others, but I fancy not. Now, this infrequence has certainly not been due to any prejudice on the part of the Royal Geographical Society, which, as you know, or many of you may remember, so far back as 1869 showed a fine example by conferring its Gold Medal upon Mrs. Somerville for the great services that remarkable woman rendered to geography through her writings. The cause, therefore, must be sought elsewhere. Any paper read at these ordinary meetings must fulfil one of two conditions: it must either be a record of exploration, laying before us new facts or new aspects of facts, or, on the other hand, it must be a useful contribution to scientific geographical research dealing with the meaning, the relations, the causes, or the effects of geographical phenomena. Sometimes these two conditions have been united in a remarkable degree, yielding material of exceptional value; but it has been extremely rare that either of these conditions has been fulfilled by a woman. Now, at first sight it might appear to an impartial observer—say, to the often-quoted visitor from the planet Mars—that research in any department of science would be a most appropriate and tempting field for the more sedentary half of our race. Brilliant instances have proved the capacity, certainly of some women, for dealing with many departments of science, and I suppose that nobody will deny to them a fair share of that instinct of curiosity which, properly directed, becomes a thirst for knowledge. But from time immemorial that capacity has been discouraged, that instinct has been directed or perverted into less useful channels by the most powerful force in the world-conventional prejudice, which has laid it down as a sort of axiom that women are not adapted for scientific pursuits. Well, it is not for me, speaking from this chair, to judge this opinion from the standpoint of ethics or the standpoint of æsthetics. I am looking at it impartially, objectively from the geographical standpoint, as an interesting phenomenon, and I say it is interesting to remember that the nineteenth century, which threw open widely to women the door leading to the arts, kept, if not closed, yet somewhat jealously ajar, the door leading to the sciences. And, curiously enough, it defended that conventional discouragement on the ground of those very deficiencies in the average woman of exactness and thoroughness which had been the inevitable result of similar discouragement during past ages. And it is also, perhaps, more interesting to note that this conventional prejudice has tended, not only to cut off from half or more than half of the educated classes of humanity an entire quadrant of the consolation of life, an entire quadrant of the joys of life, but it has also tended to ensure that even boys shall be, during their most plastic years, brought up in a hazy atmosphere which obscures the clear outlines of knowledge, and which imbues their minds with the often ineradicable delusion that the sciences are dull, or that their altitudes are less accessible than the corresponding altitudes of the arts. However, of quite recent years there have been signs of a change. Perhaps the twentieth century may take a broader view, so that the Royal Geographical Society at some future day may have a wider area than that now open to it from which to draw papers on scientific geographical research. Exploration, of course, stands on an entirely different basis, because here conventional prejudice has not been the only, perhaps not the principal, deterrent, there are quite a number of conditions of a rather unusual kind which must be combined in order to produce a lady explorer. Of these conditions I need only mention three—sufficiency of independent means for organizing expeditions, sufficiency of power of physical endurance of hardships, and a somewhat strong love of adventure. But when these and the other conditions which I have not mentioned are combined, and when, secondly, a lady is in a position to place before us, as Mrs. Bullock Workman is, an interesting and a valuable record of exploration, it ought to be, and I believe it

is, a matter of much congratulation to this Society and to all lovers of the acquisition and diffusion of geographical knowledge. I will now invite Mrs. Bullock Workman to read her paper on "Exploration of the Hoh Lumba and Sosbon Glaciers."

After the paper, Sir FRANK YOUNGHUSBAND said: As a humble member of that fraternity which the lecturer has called "Anglo-Indian valley-pounders," I should like to congratulate her most sincerely upon her brilliant achievements in the Himalayas. I myself take the deepest possible personal interest in the lecture, because eighteen years ago I travelled immediately to the eastward of where Mrs. Bullock Workman was travelling in the journey which she has described to-night, crossing the Mustagh pass and those other great peaks; also I have had the good fortune to travel on the westward side, at the mouth of the great Hispar glacier, of which a magnificent photograph was shown to-night. I am therefore in a position to peculiarly appreciate the immense difficulties which Mrs. Bullock Workman overcame. I do not know if she ever had the experience, which I must confess I often had, of feeling all the energy and go within one gradually oozing out till there seemed nothing left to spur one on to overcome the difficulties in front. In some climates I did particularly feel that, especially in the Himalayas, and any such feeling as that seems to have been overcome by Mrs. Bullock Workman with the utmost determination. I should like to say just one word in appreciation of the Balti coolies, with whom Mrs. Bullock Workman does not seem to have had very good experience. The Balti coolies, I know, are often very trying, but it is to be remembered that they are not really mountaineers. They live in the bottom of the valleys, they do very little in the way of climbing, and, I am sure, of their own accord they never venture on these horrible glaciers. As Mrs. Bullock Workman has said, their food is not such as to produce in them any very great stamina but my experience was that there are amongst them many excellent men, and I should not like this evening to pass by without saying one word in their favour. It was with Balti coolies that I crossed the Mustagh pass, immediately eastward of the country which Mrs. Bullock Workman explored. They accompanied me the whole way into the valley of Kashmir, and but for them I should never have got across the Mustagh pass into Kashmir. I was then even more unaccustomed to mountain travel. I had no idea what the difficulties were; I placed myself entirely in their hands, and they accepted the trust and carried me over. I therefore should like to say these few words in appreciation of these coolies, and I hope, when next Mrs. Bullock Workman does us the privilege of travelling on the Indian frontier, she may have more pleasant experience with them than she evidently had last year. I wish to thank Mrs. Bullock Workman most sincerely for the interesting and valuable lecture she has given us this evening, and for those highly interesting series of photographs, which give a most excellent idea of those fascinating mountains.

Captain RAWLING: This is quite an unexpected call upon me to make a speech. The only thing I can think of is what Sir Frank Younghusband has been saying about the Balti coolie. The little experience I have had tends to show they have always done excellent work. They carried on communications through the pass, and it was really through them, chiefly in the transport line, that the advance forces were supplied with food, which enabled the Tibetan Mission to move finally on to Tibet.

The PRESIDENT. I regret to say that Sir Thomas Holdich, whom every one knows in connection with the Survey of India, had looked forward very much to coming here and speaking on this paper; in fact, up to yesterday he hoped to be able to come, but he has a severe chill, and won't be able to address you. Sir

Martin Conway is on the continent, and Colonel Gore, another great authority, has gone to India. I do not know whether there is any one else in this audience who is competent to discuss the question. I certainly am not. If there is any one, we shall be very glad to hear him.

It only remains for us to give a vote of thanks, which I am sure this time will be exceptionally genuine, to Mrs. Bullock Workman for her most admirable paper.

BATHYMETRICAL SURVEY OF THE FRESH-WATER LOCHS OF SCOTLAND.*

Under the Direction of Sir JOHN MURRAY, K.C.B., F.R.S., D.Sc., etc., and LAURENCE PULLAR, F.R.S.E.

PART X. THE LOCHS OF THE NAVER, BORGIE, KINLOCH, AND HOPE BASINS.

IN this paper it is proposed to deal with the lochs of north-west Sutherlandshire, draining by the rivers Naver, Borgie, Kinloch, and Hope into the North Atlantic, along the north coast of Scotland, which have been sounded by the staff of the Lake Survey, viz. Lochs na Meide, Naver, a' Bhealaich, Coir' an Fheàrna, Syre, Cùil na Sìthe, Laoghal, Creagach, Chaluim, an Dithreibh, and Hope. The district under consideration is shown in the index-map (Fig. 1), and extends from Loch Eriboll and Torrisdale bay on the north, to Ben Armine and Meall a' Fhuarain on the south, and Ben Hee, Meallan Liath, and Meall Horn on the west, including also the mighty peaks of Ben Hope and Ben Klibreck, which exceed 3000 feet in height. The scenery of the district may be described as wild, grand, and mountainous. The total area of the four basins, as measured by the planimeter on the 1-inch Ordnance Survey maps, is about 382 square miles, as follows: –

Naver basin	199 square miles
Borgie „	62 „
Kinloch „	46 „
Hope „	75 „
	382 „

Of this area, about 240 square miles (or nearly two-thirds) drain into the lochs under discussion, as will be seen by the summary table at the end of this paper. These lochs include the largest in the extreme north of Scotland, five of them exceeding three miles in length, while two of them exceed six miles in length. Three of the lochs have each a superficial area exceeding 2 square miles, the largest in this respect being Loch Laoghal, which, though only $4\frac{1}{2}$ miles in length as compared with the 6 miles of Lochs Naver and Hope, exceeds the two last-named

* Plates, p. 224.

lochs both in maximum breadth and mean breadth. Loch Laoghal has also the distinction of being the deepest of the series, and of containing the largest volume of water. The lochs are famous for their fishing, but most of them are preserved; they all contain fine trout, and *salmo ferox* has been taken in Lochs Naver, a' Bhealaich, Laoghal, and Creagach, and salmon in Lochs Naver and Coir' an Fheàrna.

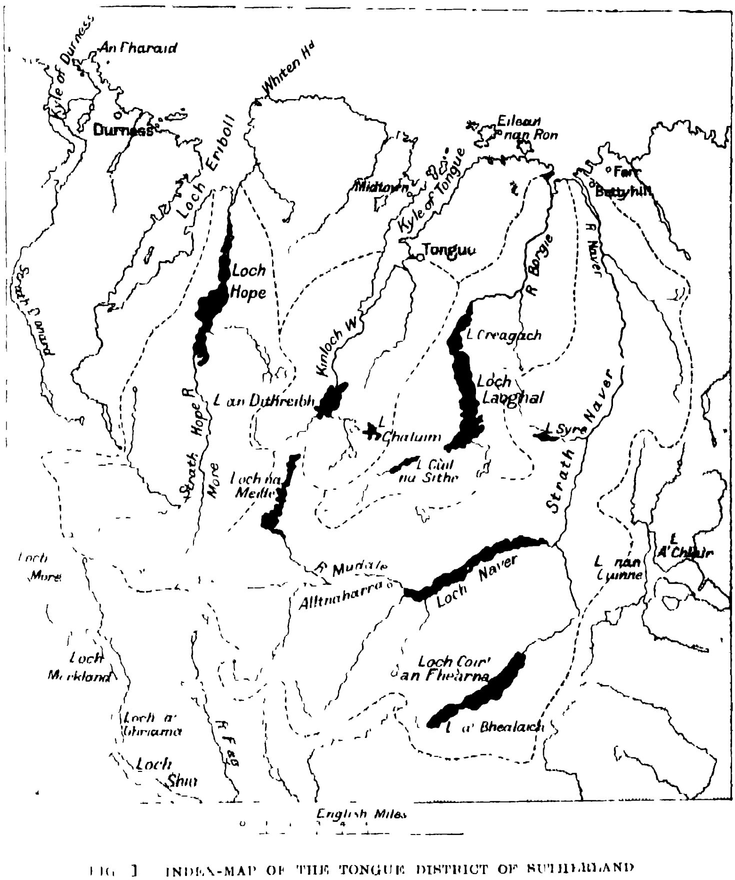


FIG. 1. INDEX-MAP OF THE TONGUE DISTRICT OF SUTHERLAND.

1. *Lochs of the Naver Basin.*

There are five lochs within this basin to be dealt with here, of which the largest is Loch Naver, though Loch Coir' an Fheàrna has a greater depth; a few small lochs within the basin could not be sounded by the Lake Survey for lack of boats. The overflow from Loch na Meide is

carried by the Amhainn Bheag and River of Mudale into Loch Naver, and shortly after leaving Loch Naver the river Naver is joined by the river Mallart, bearing the overflow from Lochs a' Bhealaich and Coir' an Fheàrna, while still further on the river Naver is joined by the Langdale Burn, bearing the overflow from Loch Syre. Of the total area of the basin, about 119 square miles, or 60 per cent., drain into these five lochs.

Loch na Meide (see Plate I.).—Loch na Meide (or Meadie) lies about 10 miles to the south of Tongue, and about 22 miles to the north of Lairg, which is the nearest railway station. It trends nearly north and south, and is very irregular in outline, the northern portion being narrow, while the southern portion widens out considerably; there is a very narrow and shallow constriction near the middle, which practically cuts the loch into two portions. It is $3\frac{1}{3}$ miles in length, and has a maximum breadth near the southern end of over a mile, the mean breadth of the entire loch being a quarter of a mile. Its waters cover an area of about 555 acres, or nearly 1 square mile, and it drains an area of 8 square miles. The maximum depth of 63 feet was observed in the wide southern portion of the loch, but towards the eastern shore, about 650 yards from the southern end, and only about 100 yards from one of the small unnamed islands. The volume of water is estimated at 498 million cubic feet, and the mean depth at $20\frac{1}{2}$ feet. The loch was surveyed on September 25, 1902, when the elevation of the lake-surface was found by levelling from bench-mark to be 488·35 feet above the sea.

Loch na Meide is very irregular in conformation, with many small islands in the southern half, the largest of which is named Eilean Mòr. The deepest water was found near the southern end; a sounding in 44 feet was taken about 200 yards from the southern shore, and there is a small area about one-third of a mile in length exceeding 50 feet in depth. In close proximity a sounding of 22 feet was taken, surrounded on all sides by deeper water. On approaching the central constriction, in which the depth is only 2 feet, the water shoals gradually though irregularly, and deepens again on proceeding towards the northern end, where a maximum depth of 40 feet was observed about half a mile from the upper end, and where there is a small area about one-third of a mile in length exceeding 30 feet in depth. The following table gives the areas between the contour-lines, and the percentages to the total area of the loch, and shows that on the whole Loch na Meide is rather shallow, since 70 per cent. of the lake-floor is covered by less than 25 feet of water:—

Feet.	Acres.	Per cent
0 to 25	388	70
25 „ 50	149	27
Over 50	18	3
	555	100

The temperature of the surface water at 10 a.m. on the date of the survey was 53°·0 Fahr., the air-temperature being 60°. The deposits brought up were all very dark (black) muds.

Loch Naver (see Plate II.).—Loch Naver lies about 5 miles to the south-east of Loch na Meide, with Ben Klibreck to the south rising gently up from the shore of the loch. Altnaharra Inn, at the west end of the loch, is a well-known rendezvous for anglers. On the northern shore Reidhachaisteil and Gruamamor, and on the southern shore Ruighnasealbhaig, are the remains of considerable villages destroyed at the beginning of last century when the crofters were turned out. There are the ruins of Pictish towers near Gruamamor and on the island close to the opposite (southern) shore, and the remains of several artificial crannogs rise towards the surface of the water, in one case reaching above the surface. Loch Naver is broadly sinuous in outline, the general trend being east-north-east and west-south-west, while the upper portion for about a mile runs east and west, and it exceeds 6 miles in length. It is a comparatively narrow loch, the maximum width towards the west end not exceeding two-thirds of a mile, whence the width gradually diminishes towards the east end, the mean breadth of the entire loch being about one-third of a mile, or 6 per cent. of the length. Its waters cover an area of about 1446 acres, or $2\frac{1}{4}$ square miles, and it drains directly an area of nearly 81 square miles; but since it receives the outflow from Loch na Meide, its total drainage area is nearly 89 square miles. The maximum depth of 108 feet was observed in the wider part of the loch about a mile from the west end. The volume of water contained in the loch is estimated at 2461 millions of cubic feet, and the mean depth at 39 feet. The loch was surveyed on September 24 and 25, 1902, when the elevation of the lake-surface was determined by levelling from bench-marks as being 247·6 feet above the sea; when visited by the officers of the Ordnance Survey on June 24, 1870, the elevation was found to be 246·9 feet above sea-level. The highest drift-mark observed was $4\frac{1}{2}$ feet above the surface of the water at the time of the survey, and it was said that the water might fall to the extent of 4 feet, giving a range in level of about $8\frac{1}{2}$ feet.

The floor of Loch Naver is rather irregular, as may be seen in the longitudinal section taken along the axis of maximum depth, which shows how the bottom rises and falls on proceeding from one end of the loch to the other. The 25-feet contour-line is discontinuous opposite the entrance of the Allt Gruama Beag, where the deepest sounding was 24 feet, the water deepening both to the east and to the west. The 50-feet contour is continuous, enclosing an area nearly 4 miles in length, distant from the east end about $1\frac{3}{4}$ miles, and approaching to within one-third of a mile from the west end; within this area, however, the bottom rises in two places, where soundings of 40 and 43 feet were

taken. There is a small isolated 75-feet area opposite Càrn Gruama Beag, based on soundings of 76 and 80 feet, separated from the principal 75-feet basin by an interval of over a quarter of a mile, in which the greatest depth is 62 feet; the main 75-feet area is 2¼ miles in length, and approaches to within three-quarters of a mile from the west end. There are two very small 100-feet areas, based upon isolated soundings of 100 and 108 feet, the former opposite Gruamamor, the latter farther up the loch west of Reidhachaisteil. A short distance to the west of the deepest sounding (108 feet) is a rise of the bottom covered by 40 feet of water already mentioned, and to the north-east near the northern shore is a bank covered by only 1 foot of water surrounded by much deeper water. Off the southern shore at Coill Ach' a' Chuil, towards the east end of the loch, is another bank with 6 feet of water on it, in close proximity to a sounding of 30 feet. The following table gives the areas between the consecutive contour-lines, and the percentages to the total area of the loch:—

Feet.				Acres		Per cent.
0 to 25	...	...	...	551	...	38·1
25 to 50	...	..	...	425	...	29·4
50 to 75	...	...	...	301	...	20·8
75 to 100	...	..	..	167	...	11·6
Over 100	...	...	...	2	...	0·1
				1446		100·0

Temperature observations taken on September 24, 1902, gave readings of 54° Fahr. at the surface, at 25 feet, and at 50 feet; while at 80 feet the temperature was 53°·5, the air-temperature at the time being 59°.

Loch a' Bhealaich (see Plate III.). Loch a' Bhealaich (or a Vellich or Vealloch) lies about 4½ miles to the south of the western portion of Loch Naver, with Ben Klibreck rising between them. It is almost continuous with the larger Loch Coir' an Fheàrna, the connecting stream between them being only about 200 yards in length, and the difference in level less than 2 feet. To the north of the two lochs Ben Klibreck slopes gently up to over 3000 feet, while the ground to the south is not so high, but much steeper; so steep is that around Loch a' Bhealaich (which lies in a very fine corrie) that even at noon on the date of the survey the sun could not be seen, except by going over to the north-west shore. The two lochs trend in a north-east and south-west direction, and together have a total length of 1¾ miles. Loch a' Bhealaich exceeds 1½ miles in length, with a maximum breadth of a quarter of a mile. Its waters cover an area of about 175 acres, or over a quarter of a square mile, and it drains an area of nearly 6 square miles. The maximum depth of 80 feet was observed towards the north-east end of the loch. The volume of water is estimated at

238 million cubic feet, and the mean depth at over 31 feet. The loch was surveyed on October 17, 1902, when the elevation of the lake-surface was found to be 572·2 feet above sea-level. The water might rise 2 or 3 feet above, and fall about $1\frac{1}{2}$ feet below, that level.

The main body of Loch a' Bhealaich is quite simple in conformation, but at the north-east end there is a small expansion of the loch, having a maximum depth of 14 feet, separated from the main body by a constriction in which the depth is 9 feet. The 25-feet area is over a mile, and the 50-feet area over half a mile, in length, the deeper water being contained in the north-eastern half of the loch, the deepest sounding in 80 feet having been taken about a quarter of a mile from the north-eastern shore. The areas between the contour-lines and the percentages to the total area of the loch are as follows:—

Feet.	Acres.	Per cent.
0 to 25	77	44
25 „ 50	69	39
Over 50	29	17
	175	100

Temperature observations taken in the deepest part of the loch gave 48°·9 Fahr. at the surface and at 40 feet, a reading at 76 feet giving 48°·4.

Loch Coir' an Fhedrna (see Plate III.).—Loch Coir' an Fheàrna (or Corr, or a-Choire) is a fine sheet of water, well wooded along the south-eastern shore, the Duke of Sutherland's lodge standing at the lower (north-eastern) end. It is over 3 miles in length and comparatively uniform in breadth, the maximum breadth being half a mile, and the mean breadth over one-third of a mile. Its waters cover an area of about 737 acres (considerably over 1 square mile), and it drains directly an area of about $18\frac{1}{2}$ square miles, but since it receives the outflow from Loch a' Bhealaich, its total drainage area is about $24\frac{1}{2}$ square miles. The maximum depth of 151 feet was observed comparatively near the south-west end. The volume of water is estimated at 1886 millions of cubic feet, and the mean depth at nearly 59 feet. The loch was surveyed on October 15 to 17, 1902; the elevation of the lake-surface on commencing the survey on the 15th was found to be 569·7 feet above sea-level, but the water rose to the extent of 9 inches by the 17th, when Loch a' Bhealaich was surveyed. On the 15th the water was about its lowest level, and might rise 2 or 3 feet.

Loch Coir' an Fheàrna is quite simple in conformation, with the deeper water lying towards the south-west end—that is, towards the peninsula separating it from Loch a' Bhealaich, and the fact that in Loch a' Bhealaich the deeper water also approaches the separating peninsula seems to suggest that the two lochs may at one time have

been continuous. The contour-lines all enclose continuous areas, approaching much nearer to the south-west than to the north-east end, indicating a more gentle slope towards the north-east. Thus the 100-feet area is distant about three-quarters of a mile from the north-east end, but approaching to within less than a quarter of a mile from the south-west end, and the maximum depth of 151 feet was observed about half a mile from the south-west end. The slope along the south-east shore is as a rule steeper than along the opposite shore, and this is especially the case off Creag Chraobhach, at the position of the deepest sounding, where a sounding in 46 feet was taken about 50 feet from shore. This is shown in cross-section G-H on the map. The areas between the contour-lines at intervals of 50 feet, and the percentages to the total area of the loch, are as follows:—

Feet.	Acres.	Per cent.
0 to 50	343 ...	46.6
50 " 100	269 ...	36.5
100 " 150	124 ...	16.8
Over 150	1 ...	0.1
	737	100.0

Temperature observations taken in the deepest part of the loch at 1.30 p.m. on October 16, 1902, gave readings of 50°.0 Fahr. at the surface, at 20 feet, and at 80 feet, and a reading of 49°.8 at 130 feet, the air-temperature being 45°.

Loch Syre (see Plate IV.).—Loch Syre lies about $3\frac{1}{2}$ miles to the north of the east end of Loch Naver, on the high ground between Strath Naver and Loch Laoghal, the last-named loch being only about $1\frac{1}{2}$ miles distant to the west. It is an irregular shallow loch, with several islands in it, and the eastern part is full of stones. From east to west it has a length of nearly three-quarters of a mile, with a maximum breadth of over half a mile. Its waters cover an area of about 106 acres, and it drains an area of over 5 square miles. The maximum depth of 12 feet was observed in the south-eastern part of the loch. The volume of water is estimated at 25 million cubic feet, and the mean depth at $5\frac{1}{4}$ feet. The loch was surveyed on October 1, 1902, when the elevation of the lake-surface was found to be 412·8 feet above the sea; when levelled by the officers of the Ordnance Survey on July 23, 1870, the elevation was 411·4 feet above sea-level. The level of the loch has been raised over a foot by means of a dam above the first island, and it was proposed to raise it still further to the extent of 2 or 3 feet. At the time of the survey the highest drift-mark observed was about 2 feet above the water, which might fall about a foot.

The floor of Loch Syre is irregular, as might be expected from its extremely irregular outline and many islands. The deepest water was

found in the south-eastern angle of the loch, where there is a small area over 10 feet in depth, the deepest cast in 12 feet having been taken about 100 yards from the eastern shore and 150 yards from the southern shore. Between the deepest sounding and the southern shore the bottom rises to 9 feet and sinks again to 11 feet close inshore. The area of the lake-floor covered by less than 10 feet of water is about 97 acres, or 92 per cent. of the entire area of the loch. The temperature of the surface water on the date of the survey was 54°·7 Fahr., the air-temperature being 51° Fahr.

2. *Lochs of the Borgie Basin.*

The three lochs to be dealt with here form a connected series, the overflow from Loch Cùil na Síthe being carried into Loch Laoghal by the Lòn Achadh na h-Aibhne, while Lochs Laoghal and Creagach are almost continuous, the connecting stream being only about 200 yards in length. Of the total area of the basin, about 35 square miles, or 56 per cent., drain into these three lochs.

Loch Cùil na Síthe (see Plate IV.).—Loch Cùil na Síthe (or Coulside) is a small narrow loch lying over a mile to the west of the head of Loch Laoghal, and about 5 miles to the north of Altnaharra, at the head of Loch Naver. It trends east-north-east and west-south-west, and is very nearly a mile in length, varying little in width, the maximum breadth being about 250 yards. Its waters cover an area of about 58 acres, and it receives the drainage from a comparatively large tract of country, the drainage area being about 9 square miles—an area a hundred times greater than that of the loch. The maximum depth of 14 feet was observed in two places near the middle of the loch. The volume of water is estimated at 19 million cubic feet, and the mean depth at $7\frac{1}{2}$ feet. The loch was surveyed on September 29, 1902, but the elevation of the lake-surface above the sea could not be determined; a drift-mark was observed over 6 feet above the water, which might fall to the extent of a foot, giving a range in level exceeding 7 feet.

Loch Cùil na Síthe is extremely simple in conformation, and comparatively uniform in depth. The upper portion is being silted up, and is occupied by weeds, and the lower portion is full of stones. The 10-feet contour coincides approximately with the outline of the loch, and encloses an area of about 20 acres, or 35 per cent. of the total area of the loch. The temperature of the surface water on the date of the survey was 56°·2 Fahr., and a reading at a depth of 11 feet gave 53°·9.

Loch Laoghal (see Plate V.).—Loch Laoghal (or Loyal) is distant about $4\frac{1}{2}$ miles from Tongue and about 6 miles from Altnaharra, the road between these two places running alongside the western shore of

the loch throughout its whole length. To the west rises Ben Loyal, one of the most beautiful of mountains, with picturesque outline, the highest point exceeding 2500 feet; beyond Leitirmhòr the granite is being quarried for building purposes, leaving a great scar on the hillside. To the east of the northern portion of the loch rises Beinn's Tomaine (Ben Stomino) to a height of 1728 feet, along the base of which the shore of the loch is thickly wooded. In outline the loch resembles somewhat a Wellington boot, with the toe pointing in a westerly direction, while the body of the loch trends almost north and south. The loch is $4\frac{1}{2}$ miles in length, with a maximum breadth of nearly a mile, the mean breadth exceeding half a mile. The waters of the loch cover an area of about 1630 acres, or over $2\frac{1}{2}$ square miles, and it drains directly an area of over 24 square miles, but since it receives the overflow from Loch Cùil na Síthe, its total drainage area exceeds 33 square miles. The maximum depth of 217 feet was observed near the foot of the loch, little more than half a mile from the northern shore. The volume of water contained in the loch is estimated at 4628 millions of cubic feet, and the mean depth at $65\frac{1}{4}$ feet. The loch was surveyed on September 26 to 29, 1902, and the elevation of the lake-surface on commencing the survey was found, by levelling from bench-mark, to be 369·9 feet above the sea; when levelled by the officers of the Ordnance Survey on August 29, 1870, the elevation was found to be 369·2 feet above sea-level. The highest drift-mark observed was $2\frac{1}{2}$ feet above the surface of the water at the time of the survey, and it was stated that the water might fall to the extent of a foot.

Loch Laoghal contains two deep basins, the larger and deeper in the northern portion of the loch, and the smaller and shallower towards the head of the loch, separated by a shoaling of the bottom about $2\frac{1}{2}$ miles from the foot of the loch, where there is a slight constriction in the outline. The 50-feet contour-line is continuous, and encloses an area about 4 miles in length, extending from quite close to the northern end to within half a mile from the south-western end. There are two 100-feet basins: the smaller one approaches to within less than a mile from the head of the loch, and is three-quarters of a mile in length, the maximum depth observed therein being 137 feet, about $1\frac{1}{2}$ miles from the south-west end; the larger one is over 2 miles in length, and approaches to within about 250 yards from the northern end, enclosing the deepest part of the loch. The 150-feet area is about $1\frac{1}{4}$ miles in length, and distant about a quarter of a mile from the northern end. The 200-feet area is nearly three-quarters of a mile in length, distant less than half a mile from the northern end. The longitudinal section on the map shows how rapidly the water deepens on proceeding from the northern end along the central line of the loch, while the opposite end of the loch is comparatively shallow and the

slope of the bottom there gentle; it also shows the considerable rise of the bottom between the two deep basins. The cross-section G–H is taken at the position of the deepest sounding, and shows a slight rise of the bottom off the western shore from 80 to 75 feet. This section shows a steep off-shore slope at both sides of the loch, but more especially off the eastern shore, where a sounding in 78 feet was taken about 80 feet from shore, and this steep slope off the eastern shore is continued to the northward, where a sounding in 48 feet was taken about 60 feet from shore. The soundings taken on the rise between the two deep basins indicate a rather uneven floor; for instance, one line of soundings from west to east shows that the bottom sinks gradually from the western shore to 86 feet, then rises to 60 feet, sinks to 75 feet, rises to 30 feet, sinks slightly again to 32 feet, and then rises towards the eastern shore; a little farther south a sounding was taken in 40 feet between two deeper soundings (54 and 57 feet).

The following table gives the approximate areas between the consecutive contour-lines, and the percentages to the total area of the loch :—

Feet		Acres		Per cent.
0 to 50	.. . .	612	...	38
50 „ 100	.. ..	522	..	32
100 „ 150	... ...	246	...	15
150 „ 200	... ...	200	...	12
Over 200	... ...	49	...	3
		1629		100

Temperature Observations.—Many observations of the temperature of the surface water in Loch Laoghal were taken on September 26, 27, and 29, 1902, and two serial temperatures were taken on September 29, one in each of the two deep basins. The surface temperature varied from 52°·5 to 53°·6 Fahr., the temperature of the air during the same period varying from 55° to 58°. The serials gave the following results :—

Depth in feet.	Deepest part of loch Sept 29, 1902, noon.	Southern deep basin Sept 29, 1902, 2 p m
	Fahr	Fahr
0	53 0	53·6
10	52 5	53 4
15	52·4	—
20	52 5	—
25	52 5	52 9
27 5		52 6
30	—	53 6
35	-	52 2
40	—	52 4
50	52·5	52·4
70	52·4	52·3
100	52 4	52 5
125	50 9	—
135	47·8	52 3
145	46·7	—
150	46·5	—
195	46·1	—

These observations show an extreme range throughout the loch amounting to 7°·5, but the greater part of this range was observed beyond the depth of 100 feet in the deepest part of the loch, the range from the surface down to 100 feet not exceeding 1°·4. In the southern shallower basin the temperature varied little down to the bottom in 135 feet, there being no decrease in temperature beyond 100 feet, whereas at a depth of 135 feet in the northern deeper basin the temperature was 4°·5 lower than at a similar depth in the southern basin, and the temperature at the bottom of the deeper basin was 6° lower than anything observed in the shallower basin.

Loch Creagach (see Plate V.).—Loch Creagach (or Craggie) lies immediately to the north of Loch Laoghal and at the same level, the short stream between them having a slight current flowing from Loch Laoghal into Loch Creagach. At the north end of Loch Creagach there is a small expansion of the outflowing river, called Loch Slaim (or Slam), which was not sounded. The general trend of Loch Creagach is nearly north and south, with a slight bend in the outline, the northern portion running towards the north-east. It is over 1¼ miles in length, with a maximum width in the southern portion of half a mile. Its waters cover an area of nearly 300 acres, or nearly half a square mile, and it drains directly an area of 1¼ square miles; but since it receives the outflow from Lochs Laoghal and Cùil na Sìthe, its total drainage area is nearly 35 square miles. The maximum depth of 84 feet was observed near the middle of the loch. The volume of water is estimated at 429 million cubic feet, and the mean depth at 33 feet. The loch was surveyed on September 27, 1902, when the elevation of the lake-surface was found to be identical with that of Loch Laoghal, viz. 369·9 feet above the sea; when levelled by the Ordnance Survey officers on August 27, 1870, the elevation was 369·2 feet above sea-level, as in the case of Loch Laoghal.

Loch Creagach resembles Loch Laoghal in that it contains two deep basins, which are separated by shallower water at the position of the constriction in the outline of the loch towards the northern end. The deeper basin occupies the wide southern portion of the loch, towards the peninsula separating this loch from Loch Laoghal, in which also the deeper water approaches the dividing peninsula, suggesting that at one time the two lochs may have formed a continuous sheet of water. The principal 50-feet area is about three-quarters of a mile in length, distant less than a quarter of a mile from the southern end of the loch. Within this basin there is a small elevation covered by 47 feet of water in the widest part of the loch towards the eastern shore. The maximum depth of the loch (84 feet) occurs a short distance to the north of this elevation, and about three-quarters of a mile from both ends, but towards the western shore, as will be seen in cross-section C-D on the

map. Towards the northern end of the loch lies the second 50-feet area, based on soundings of 50 and 51 feet, and of small extent, the greatest depth recorded on the ridge separating the two deep basins being 20 feet close to the eastern shore. The contour of the bottom is shown in the longitudinal section A–B on the map. The areas between the consecutive contour-lines, and the percentages to the total area of the loch, are as follows :—

Feet.	Acres.	Per cent.
0 to 25	138	46·4
25 „ 50	78	26·2
50 „ 75	74	24·9
Over 75	7	2·5
	297	100·0

The temperature of the surface water on the date of the survey was 54° Fahr., and four readings beneath the surface in the deepest part of the loch gave identical results, viz. 53° at depths of 10, 25, 50, and 70 feet, the air-temperature being 59°.

3. *Lochs of the Kinloch Basin.*

There are two lochs to be dealt with here, viz. Loch Chaluim and Loch an Dithreibh, the superfluent waters of which are carried into the Kyle of Tongue by the Amhainn Ceann Locha (or Kinloch river). Loch Chaluim is the only one of several small lochs in the basin which could be sounded, and it flows by the Allt an Dithreibh into Loch an Dithreibh. The two lochs form a complete contrast in outline and conformation of the bottom.

Loch Chaluim (see Plate VI.).—Loch Chaluim lies on the south-western flank of Beinn Laoghal, little more than a mile from Loch Cùil na Sìthe in the Borgie basin. It is most irregular in outline and in conformation, with one comparatively large island, and with weeds obstructing many of the bays. Measured in a south-west and north-east direction, it is about three-quarters of a mile in length, with a maximum breadth of half a mile, its waters covering an area of about 96 acres. The maximum depth of 30 feet was observed in the extreme western portion of the loch, the mean depth being estimated at 8 feet, and the volume of water at 33 million cubic feet. The loch was surveyed on September 29, 1902, but the elevation of the lake-surface above the sea could not be determined.

Loch Chaluim is on the whole shallow, only three soundings exceeding 20 feet having been recorded in the most westerly expansion of the loch. There are two 10-feet basins, the principal one extending from the extreme west end of the loch to beyond the island, filling up the south-western expansion of the loch to the south of the island, and enclosing the deepest part of the loch, the smaller one lying in the

eastern and south-eastern expansions of the loch, and having a maximum depth of 17 feet. The greater part of the lake-floor is covered by less than 10 feet of water, equal to about 69 acres, or 72 per cent. of the total area. A series of temperatures was taken in the deepest part of the loch, with the following results:—

Surface ...	55°·8 Fahr
2 feet ...	55°·7 "
3 " ...	55°·4 "
3·5 " ...	55°·2 "
4 " ...	53°·6 "
5 " ...	53°·1 "
10 " ...	53°·0 "
20 " ...	53°·1 "

This series shows a range of 2°·8, there being a fall of no less than 1°·6 between $3\frac{1}{2}$ and 4 feet.

Loch an Dithreibh (see Plate VI.).—Loch an Dithreibh (or Deerie, or Derry) lies less than 3 miles to the south of the head of the Kyle of Tongue, with Ben Loyal to the east and the lofty Ben Hope, a magnificent object in the landscape, to the west. The general trend of the loch is north-north-east and south-south-west, the main body of the loch trending almost north and south, and throwing out an arm towards the north-east. The loch is over $1\frac{1}{2}$ miles in length, the main body being approximately uniform in width, with a maximum breadth of two-thirds of a mile, while the north-eastern arm is much narrower; the mean breadth of the entire loch is nearly half a mile. Its waters cover an area of about 475 acres, or three-quarters of a square mile, and it drains directly an area of 10 square miles; but since it receives the overflow from Loch Chaluim, its total drainage area is $12\frac{3}{4}$ square miles. The maximum depth of 157 feet was observed approximately near the centre of the main body of the loch. The volume of water is estimated at 1366 million cubic feet, and the mean depth at 66 feet. The loch was surveyed on October 1, 1902, when the elevation of the lake-surface was found, by levelling from bench-mark, to be 267·45 feet above the sea; when levelled by the officers of the Ordnance Survey on October 26, 1870, the elevation was 267·8 feet above sea-level.

Loch an Dithreibh includes two basins (1) a larger deep basin in the main body of the loch, and (2) a smaller shallower basin in the north-eastern arm, separated by a rise of the bottom on which the deepest sounding was 49 feet. The maximum depth observed in the small subsidiary basin was 59 feet, and the separating ridge is irregular, for a sounding in 21 feet was taken in its central part surrounded by deeper water. The 25-feet contour-line is continuous from end to end of the loch, coinciding approximately with the outline of the loch, but approaching close to the eastern shore off Creag an Dithreibh and Creag na Luath-ghaire. The 50-feet area is cut into

two portions, as already indicated, the main portion approaching close to the southern end of the loch and exceeding 1 mile in length. The 75-feet area is nearly a mile in length, and at its northern border the lake-floor shows conspicuous undulations, giving to the 75-feet contour-line a strikingly sinuous character. The 100-feet area has a length of three-quarters of a mile, approaching comparatively very close to the southern shore, where a sounding in 115 feet was recorded about 150 yards off shore. The 125-feet area exceeds half a mile in length, and the small 150-feet area, based upon soundings of 151, 152, and 157 feet, occupies an approximately central position. Along the eastern shore the slope of the bottom is in places very steep. Off Creag na Luath-ghaire a sounding of 40 feet was taken about 80 feet off shore, and another sounding in 49 feet about 70 feet off shore, while off Creag an Dithreibh one sounding was taken in 65 feet about 100 feet off shore, and another sounding in 65 feet about 60 feet off shore. This last-mentioned sounding gives an angle of slope exceeding 45°, the fall exceeding 1 foot per foot. The areas between the consecutive contour-lines at equal intervals, and the percentages to the total area of the loch, are as follows:—

Feet.	Acres	Per cent.
0 to 50	204	42·9
50 „ 100	150	31·4
100 „ 150	113	23·9
Over 150	9	1·8
	476	100·0

Temperature Observations.—A series of temperatures taken in the deepest part of the loch on the date of the survey gave the following results:—

Surface	51°·0 Fahr.
25 feet	53°·5 „
50 „	53°·0 „
100 „	52°·5 „
125 „	48°·6 „
145 „	48°·4 „

the air-temperature being 53°. This series shows a range of 5°·6 from surface to bottom, the greatest fall of temperature occurring beyond the depth of 100 feet—a fall equal to about 4° between 100 and 125 feet.

4. *Lochs of the Hope Basin.*

The only loch to be dealt with here is the large Loch Hope, one of the most important and the most northerly of the Sutherlandshire lochs. There are several small hill lochs within the basin, which could not be sounded at the time of the visit of the Lake Survey. The headwaters of the basin take their rise on the flanks of Ben Hee, of Meallan Liath, and of Meall Horn, whose summits attain heights

exceeding 2500 feet. The total area of the basin is 75 square miles, of which nearly the whole drains into Loch Hope.

Loch Hope (see Plate VII.).—Loch Hope lies close to the eastern shore of Loch Eriboll on the north coast of Scotland, at an elevation of only 12½ feet above sea-level, so that a slight subsidence would convert it into an arm of the sea and a branch of Loch Eriboll. The natives declare that the sea never enters the loch, though ordinary spring tides attain a point not more than half a mile from the foot of the loch, and at the upper end three terraces are to be seen, and traces perhaps of a fourth. Ben Hope rises very steeply to a height of over 3000 feet to the south-east of the head of the loch, and the ground further north and to the west, though not so high, is also steep close to the shore; some parts of the shores are well wooded. The loch is free from islands, but on the date of the survey a reputed old castle was just showing a few inches above the water about a mile from the foot of the loch. The trend of the loch is almost north and south, and the total length exceeds 6 miles. The two ends of the loch are narrow, but it broadens out in the central portion, where there is a maximum breadth of three-quarters of a mile; the mean breadth of the entire loch is over one-third of a mile. The waters of the loch cover an area exceeding 1500 acres, or 2⅓ square miles, and it drains an area exceeding 73 square miles. The maximum depth of 187 feet was observed about midway between the two ends of the loch. The volume of water is estimated at 4032 millions of cubic feet, and the mean depth at 61½ feet. The loch was surveyed on September 30, 1902, when the elevation of the lake-surface was found, by levelling from bench-mark, to be 12·55 feet above the sea; when levelled by the officers of the Ordnance Survey on August 9, 1858, the elevation was 12·3 feet above sea-level. The highest drift-mark observed was 9 feet above the surface of the water on the date of the survey, and, according to the local gillie, the water might fall 2 feet lower, giving a total range in level of about 11 feet.

The floor of Loch Hope is somewhat uneven. Proceeding from the lower (northern) end of the loch for a quarter of a mile, one meets with a small 25-feet area, based on soundings of 26, 30, and 32 feet, whence the bottom rises in the vicinity of the reputed old castle already mentioned, which lies towards the eastern shore; off the opposite shore in this locality there were many boulders in the water. Thence proceeding to the southwards, the water rapidly deepens until it attains a depth of 104 feet opposite the entrance of the Allt an Ruighein, about 1½ miles from the foot of the loch. Thence for a distance of about three-quarters of a mile the bottom rises again until the depth in the centre is 44 feet, with deeper water on both sides. This shoal coincides with a narrowing in the outline of the loch, whence to the south the loch broadens out and the water deepens so rapidly that at

a distance of little more than half a mile from the 44-feet sounding the maximum depth of the loch (187 feet) is met with. A section across the loch in the position of the deepest sounding is shown in cross-section C–D on the map. From this position the bottom rises gradually, though irregularly, towards the head of the loch. A section down the centre of the loch along the axis of maximum depth is shown in longitudinal section A–B on the map, which brings out the salient features in the conformation of the lake-floor, but gives no indication of some of the minor irregularities. For instance, the 44-feet shoal already referred to is not shown because a depth of 56 feet occurs nearer the western shore, nor another shoaling covered by 117 feet of water to the south of the deepest sounding. The off-shore slope is in some places rather steep—for instance, along the eastern shore, where off the entrance of the Allt a' Mhuilinn a sounding in 53 feet was taken about 60 feet from shore, and off the entrance of the Allt a' Phris Ghil a sounding in 28 feet was taken about 30 feet from shore; also along the western shore about $1\frac{1}{2}$ miles from the head of the loch, where a sounding in 25 feet was taken about 30 feet from shore. The following table gives the approximate areas between the contour-lines at equal intervals, and the percentages to the total area of the loch:—

Feet	Acres.	Per cent.
0 to 50	723	48·0
50 „ 100	474	31·5
100 „ 150	218	14·5
Over 150	91	6·0
	1506	100·0

Temperature Observations.—A series of temperatures was taken at 3 p.m. on the date of the survey in the deepest part of the loch, with the following results:—

Surface	54°·6 Fahr.
5 feet	54°·6 „
10 „	54°·5 „
25 „	54°·2 „
50 „	54°·0 „
100 „	53°·3 „
120 „	53°·0 „
135 „	52°·1 „
150 „	49°·2 „

This series shows a range from surface to bottom amounting to 5°·4. The upper layers of water are practically uniform in temperature, the decrease from the surface down to 50 feet being only 0°·6, down to 100 feet 1°·3, and down to 120 feet 1°·6, whereas between the depths of 120 and 150 feet the fall of temperature was 3°·8. It was stated that the loch freezes all over in winter.

SUMMARY TABLE

Giving Details concerning the Lochs described in this Paper.

Loch	Height above sea Feet	Number of soundings	Length in miles	Breadth in miles		Mean breadth per cent of length	Depth.			Ratio of depth to length		Volume in million cubic feet.	Area in square miles.	Drainage area.	
				Max	Mean		Max. Feet.	Mean Feet	Mean per cent of max	Max.	Mean			Total in square miles	Ratio to area of loch.
na Meide	488.35	168	3.33	1.17	0.26	7.8	63	20.61	32.7	279	853	498	0.87	8.05	9.3
Naver	247.6	240	6.18	0.66	0.37	6.0	108	39.06	36.2	302	835	2,461	2.26	88.78	39.3
a' Bhealaich	572.2	55	1.60	0.24	0.17	10.6	80	31.20	39.0	106	271	238	0.27	5.86	21.7
Coir' an Fheàrna ...	569.7	114	3.15	0.48	0.37	11.7	151	58.79	38.9	110	283	1,886	1.15	24.48	21.3
Syre	412.8	52	0.70	0.59	0.24	34.3	12	5.48	45.6	308	675	25	0.17	5.34	32.4
Cùil na Sìthe ...	—	46	0.96	0.14	0.10	10.4	14	7.42	53.0	211	398	19	0.09	8.91	99.0
Laoghal	369.9	269	4.46	0.89	0.57	12.8	217	65.21	30.1	109	361	4,628	2.55	33.05	13.0
Creagach	369.9	77	1.57	0.48	0.30	18.8	84	33.17	39.5	93	250	429	0.46	34.83	75.1
Chaluim	—	71	0.78	0.56	0.19	24.4	30	7.92	26.4	137	520	33	0.15	2.67	17.8
an Dithreibh	267.45	83	1.55	0.64	0.48	31.0	157	65.93	42.0	52	124	1,366	0.74	12.66	17.1
Hope	12.55	234	6.13	0.77	0.38	6.3	187	61.47	32.9	173	527	4,032	2.35	73.37	31.2
		1409										15,615	11.06	239.46 *	21.7

* The drainage area of Loch na Meide is included in that of Loch Naver, that of Loch a' Bhealaich in that of Loch Coir' an Fheàrna, those of Lochs Cùil na Sìthe and Laoghal in that of Loch Creagach, and that of Loch Chaluim in that of Loch an Dithreibh.

The details regarding the lochs dealt with in this paper are collected together in the preceding table for convenience of reference and comparison. From this table it will be seen that in the eleven lochs under consideration over 1400 soundings were taken, and that the aggregate area of the water-surface is over 11 square miles, so that the average number of soundings per square mile of surface is 127. The aggregate volume of water contained in the lochs is estimated at about 15,600 millions of cubic feet. The area drained by these lochs is about 239½ square miles, or twenty-two times the area of the lochs.

NOTES ON THE GEOLOGY OF THE DISTRICT BETWEEN LOCH HOPE AND STRATH NAVER.

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The district extending from Loch Hope to Strath Naver, in the north of Sutherland, has not yet been wholly mapped by the Geological Survey.

The north-western tract, embracing the lower part of Loch Hope, comes within the belt of territory affected by the Post-Cambrian movements to which reference has been made in the description of the geology of the districts of Loch Assynt and Loch Maree.* Hence, on the hill-slopes on either side of the river Hope we find various subdivisions of the Cambrian system, repeated by folds and reversed faults, and overlaid by slices of Archæan gneiss, which resemble portions of the old floor on which the Cambrian strata rest unconformably west of Loch Eriboll and the Kyle of Durness.

East of these displaced masses there is a great succession of crystalline schists stretching eastwards to Strath Naver, which, in the north of Sutherland, are everywhere separated from the rocks to the west by a powerful line of disruption, termed the Moine thrust. They consist of two main types—flaggy quartzose granulites and garnetiferous muscovite-biotite schists with intermediate varieties—the whole evidently representing an altered sedimentary series. Bands of garnetiferous hornblende-schist are intercalated in these granulitic schists, which are, without doubt, deformed intrusive sheets of igneous material. The lithological characters of the strata, the order of succession, and the peculiar system of folding are magnificently displayed on Ben Hope (3040 feet), where the divisional planes generally dip to the east-south-east at angles varying from 12° to 30°. But in addition to these members of the Moine series, which are now generally regarded as altered sediments, there are belts of massive, hornblendic, and micaceous gneisses resembling the Lewisian types in the north-west of Sutherland. The precise relationship of these two divisions of the crystalline schists has not been definitely ascertained in this district, but it is sufficiently clear that they have been affected by a common system of folding, and in certain localities by common planes of schistosity. From the north coast, these massive basic and acid gneisses of Archæan type stretch southwards along the west side of the Borgie valley to Loch Creagach, near Loch Laoghal, and another belt of somewhat similar materials has been traced from the village of Tongue northwards by Ribigill to Loch an Dithreibh.

After the eastern schists had assumed their present crystalline characters, they were pierced by intrusive masses of granite, which form a picturesque group of peaks on Beinn Laoghal, south of Tongue. The mapping of that area leads to the

* See *Geogr. Journ.*, vol. 23, p. 461; vol. 24, p. 569.

conclusion that the granite there forms a great sill-like intrusion, which, on the north-east side of the loch of that name, branches off into minor sheets, or apophyses.

On the east side of the Kyle of Tongue there are various small outliers of Old Red Sandstone, largely composed of conglomerate, as, for instance, on Cnoc Creagach, on Beinn Bhreac, and on Cnoc an Fhreiceadain, which rest unconformably on the crystalline schists. They contain fragments of the various component members of the underlying platform, together with blocks of Cambrian quartzite and limestone.

Loch Hope.—The lower portion of this lake, measuring about 2 miles in length, is floored by thrust masses of Lewisian gneiss and deformed schistose rocks affected by the Post-Cambrian movements, while the lip of the basin, above the point where the loch discharges into the river Hope, is composed of Lewisian gneiss on the east side and Cambrian quartzites on the west. No rock is visible at the mouth of the lake, nor in the course of the stream that connects it with the sea. On either side of the river Hope there are alluvial terraces, eroded partly out of solid rock and partly out of raised beach deposits. There are remains of the 100-feet beach by the river Hope, and of the 50-feet beach at the head of the lake; hence it is evident that during their deposition the sea must have extended far up the valley.

The lower portion of the lake lies along a line of fault trending nearly north and south, which is evidently continued northwards along the channel of the river Hope, though concealed by the alluvial deposits. On either side of this line there has been a lateral shift of the outcrops of the various groups of rock, indicating a downthrow to the east. This dislocation has been proved to traverse that portion of land that juts into the loch on the west side about a mile south of Poll Ath-roinn, where the quartzose flagstones of the Moine series have been thrown down against a narrow belt of deformed Lewisian gneiss. Though the whole of Strath Mor (the valley above Loch Hope) has not been mapped by the Geological Survey, it is not improbable, judging from the straight feature, that the fault may be prolonged southwards, and may have been a prominent factor in determining the original course of the valley.

Though no rock is seen at the outlet of the lake, it is not improbable that it may be a rock basin. Its widest and deepest part lies within the area occupied by the eastern or Moine schists (Geological Survey), just above the belts of displaced and deformed Lewisian gneisses and the crushed schistose rocks in association with them. Bounded by the 75-feet contour-line, this upper basin extends for $1\frac{1}{2}$ miles above the narrows, with an average breadth of one-third of a mile. A second basin, with a maximum depth of 104 feet, occurs further down opposite Poll Ath-roinn, which is carved out of a belt of Lewisian gneiss and the mylonized rocks above the Moine thrust-plane.

As the surface of the water in Loch Hope is only 12 feet above sea-level, the greater part of the lake is below the level of the sea.

The striæ and the distribution of the drift indicate that during the early and later glaciations the ice moved from the south towards the north, so that the trend of the lake coincides generally with the direction of ice-movement.

Loch Laoghal, Loch Creagach, and Loch Slaim.—The rocks underlying this chain of lochs consist of hornblendic gneisses exposed on either side of Loch Slaim, of granulitic micaceous gneisses of the Moine series, and the granite of Beinn Laoghal and Beinn's Tomaine. Along the northern margin of this granite mass the strike of the schists is nearly east and west, the general dip of the foliation planes being towards the south at angles varying from 20° to 70°. These

rocks are visible at certain localities on either side of Loch Creagach, and on the ridges east and west of the lower end of Loch Laoghal, where they pass underneath the sill-like mass of granite and its apophyses. For a distance of upwards of 2 miles from the foot of Loch Laoghal granite occurs on both banks of the lake, but in the southern portion the granite extends continuously along the west side, while the crystalline schists occur at intervals on the east side.

Though these three lakes are now separated from each other, they may be regarded as one sheet of water, as they are nearly at the same level. The strip between Loch Slaim and Loch Creagach consists partly of moraine matter and partly of the same material arranged in the form of terraces rising to about the 400-feet contour-line. The barrier between Lochs Creagach and Laoghal is composed partly of terraced morainic matter, partly of alluvium brought down by the stream draining the north slope of Beinn's Tomaine, and partly of gravelly material driven along the spit by the prevalent west wind.

An alluvial terrace, about the 400-feet level, connects the three lakes, thereby indicating that they must have been at one time continuous. This feature does not occur in the upper part of Loch Laoghal, where the unmodified moraines extend downwards to the present shore of the loch. It is not improbable, therefore, that the upper portion may have been occupied by a glacier while the barrier of moraines beyond Loch Slaim was being lowered.

But though these lakes are ponded back by moraines at the surface, it would appear that the lower portions of Loch Creagach and Loch Laoghal may be rock basins, for at a distance of about 1½ miles below Loch Slaim the river Borgie flows over a rocky floor of hornblendic gneiss at a height of 304 feet, while the surface-level of the two upper lochs is 369 feet. The difference between these elevations is 65 feet. On referring to the chart of the soundings, it will be seen that the greatest depth of Loch Creagach is 84 feet, of the lower basin of Loch Laoghal 217 feet, and of the upper basin 137 feet. If, then, we assume that the rocky barrier 1½ miles below Loch Slaim, near Dailaneas, crosses the valley at the same level (304 feet) underneath the drift, then it follows that the depth of water below the rocky barrier is in the case of Loch Creagach 19 feet, of the lower basin of Loch Laoghal 152 feet, and of the upper basin 72 feet. The deepest part of Loch Laoghal occurs where the valley is most constricted, and where the hills on either side are loftiest.

Although no glacial markings have been found in the immediate neighbourhood of the lochs, the striæ in the surrounding district show that the ice-movement during the period of maximum glaciation was slightly west of north. The dispersal of the boulders and the disposition of the moraines indicate that during the later glaciation a confluent glacier moved northwards from the interior, one branch skirting the western slope of Beinn Laoghal, a second passing through the hollow occupied by the loch of that name, and a third round the eastern slope of Beinn's Tomaine. The stages in the gradual retreat of the mass of ice that moved down the valley of Loch Laoghal are clearly marked by a succession of moraine terraces, which enclose the small lochans shown on the chart to the east of Loch Creagach and Loch Slaim.

Loch an Dithreibh is a rock basin lying in hornblendic and micaceous gneisses, whose strike is nearly north and south and nearly parallel to the direction of the lake. They are admirably exposed on the great crag on the east side of the loch. The solid rock is not exposed at the lip of the basin, but at a point in the stream about a quarter of a mile below the outlet at a height of 261 feet, the surface of the loch being 267 feet above sea-level, and the deepest part of the basin being 157 feet.

Loch Syre, like many of the lochans east of Loch Laoghal, is surrounded with morainic deposits.

NOTES ON THE BIOLOGY OF THE LOCHS OF NORTH SUTHERLANDSHIRE.

By JAMES MURRAY.

TOW-NETTINGS were taken in seven out of the eleven lochs included in this paper. These include three deep lochs (Hope, an Dithreibh, and Laoghal), two very shallow lochs (Chaluim and na Meide), while Loch Naver is intermediate. The biological phenomena are in accordance with those differences, the plankton of the deep lakes being relatively poor, and similar to that of great lakes in general, the shallow lakes having a large admixture of littoral forms.

All the lochs were rich in algæ, especially Desmids, including many of those conspicuous species of western type, alluded to by Messrs. West, which are so characteristic of the extreme north-western fringe of Europe. The northern species of *Diaptomus*—*D. laciniatus*, *D. laticeps*, and *D. wierzejskii*—which are so widely distributed in the north of Scotland, Orkney, Shetland, and the western isles, and which are common in many lochs immediately adjacent, both to the east and south, are absent from most of the lochs of this district. *D. laticeps* is in Lochs na Meide and Naver, *D. laciniatus* in Loch na Meide only. *D. gracilis* is in six of the lochs, and in five it is the only species.

In the short lists of organisms following the name of each loch, species of general distribution are omitted, only those being included which are interesting on account of their distribution or rarity.

Loch Hope.—*Leptodora*, *Daphnia hyalina* (head rounded), *Diaphanosoma*, *Floscularia pelagica*, *Triarthra longiseta*, *Clathrulina elegans*, *Micrasterias furcata*, *Staurastrum furcigerum*, *Xanthidium subhastiferum*.

Loch an Dithreibh.—*Bosmina obtusirostris*, var. *longispina*, *Floscularia pelagica*, *Staurastrum ophiura*, cysts of *Ceratium*. Animal life (both as to individuals and species) was very scarce, while the smaller algæ were conspicuous.

Loch na Meide.—*Diaptomus laticeps*, *D. laciniatus*, *Cyclops gigas*, *Daphnia* (*galeate*), *Ilyocryptus acutifrons*, *Gastropus stylifer* (= *Notops pygmæus*), *Staurastrum ophiura*, *S. arctiscon*, *S. pseudopelagicum*, *Micrasterias apiculata*, var. *fimbriata*. This loch was remarkable for the abundance of both animal and plant life; about eighty species of organisms were found in the first cursory examination. The true plankton was not, however, particularly rich, there being a very large admixture of littoral species. *Ilyocryptus acutifrons* was first observed in Scotland in this loch, though it was afterwards found that it had been collected in Loch Shin at an earlier date.

Loch Naver.—*Diaptomus laticeps*, *Bosmina obtusirostris* (small, with long spine), *Floscularia pelagica*, *Gastropus stylifer*, *Staurastrum ophiura*, *S. arctiscon*, *S. grande*, *Micrasterias conferta*, *M. furcata* (typical, also a variety having the whole surface covered with hemispherical papillæ of unequal sizes).

Loch Chaluim.—*Daphnia* (two forms, first with small rounded head, second with very large broad, depressed head, many males), *Synchæta pectinata*, *Gastropus stylifer*, *Polychætus collinsi*, *Staurastrum ophiura*, *S. arctiscon*, *S. furcigerum*.

Loch Laoghal.—*Bosmina obtusirostris*, var. *longispina*, *Floscularia pelagica*, *Triarthra longiseta*, *Clathrulina elegans*, *Staurastrum pseudopelagicum*, *S. jaculiferum*.

Loch Creagach is connected with Loch Laoghal by a wide channel, and stands at the same level. The biology calls for no separate mention.

NOTE ON *Clathrulina elegans*, Cienk.—Skeletons of this animal were abundant in the deep lochs Hope and Laoghal. In an earlier paper of this series* an attempt was made to account for the presence of these empty shells in so many of the Scottish lochs, and as a general rule only in large ones, on the supposition that they were derived from the shallow waters in which *C. elegans* is known to live, attached to water-plants by a slender stalk. Up till quite recently only empty cases had been found, or at most an occasional shell containing an encysted mass of protoplasm, and on these facts was based the suggestion put forward as to their origin. A fresh aspect is put upon the inquiry by the recent observation that in Loch Lochy, where the animal was abundant in August, 1905, when the loch was visited in company of Prof. Bachmann, most of the shells contained living animals, which extended their pseudopodia and seemed quite at home. There was in no instance any trace of a stalk. These facts lead to the supposition that perhaps the lacustrine form may be a permanent pelagic race, or even a distinct species. Or it may be that the animal is attached when young, and becomes free when adult. There are difficulties in the way of accepting either hypothesis. If it be a true plankton form, we have to explain the absence of living animals from so many of the Scottish lochs in which the skeletons occur, and some of which have been examined at all seasons of the year. If it be a littoral form, and only casual in the plankton, it is still unexplained why the skeletons are, as a rule, only in large lakes.

THE ORDNANCE SURVEY MAPS FROM THE POINT OF VIEW OF THE ANTIQUITIES ON THEM.†

By F. J. HAVERFIELD, M.A.

It is a peculiar feature of the English Ordnance maps that they contain a large amount of archæological matter. For many years the Ordnance Department has of set purpose pursued the policy of including this matter. It has not only marked the earthworks, *tumuli*, ruins, and other remains which are still visible on the surface of the country, and has, in some cases, made special surveys of them; it has also conducted researches among printed books and instructed its surveyors to obtain local information, and has thus added the sites of vanished antiquities and the positions of various archæological discoveries. In consequence, the Ordnance maps have become an archæological record which the student is bound to consult and to reckon with.

This record is, of course, a compromise. The Ordnance maps do not pretend to form a complete archæological index of all discoveries of which the sites are known, and its scale forbids it to include the smaller details of many discoveries which it does notice. But as a practical contribution to archæology, it is good and valuable. It attains a high standard in accuracy and fulness, and it contains many details which

* *Geogr. Journ.*, vol. 26, p. 69.

† Research Department, December 20, 1905.

the indifference of local antiquaries would have allowed to pass into oblivion. This, I hope, is generally recognized. But I will venture to quote external testimony to the fact. A year or two ago I was visited by a foreign scholar—one who was competent alike as archæologist and as practical surveyor. He had been examining and remeasuring various English earthworks for comparison with certain continental examples, and had in this way obtained a first-hand and detailed knowledge of the Ordnance maps. His verdict was that in their archæological aspect with which alone we were then concerned—they compared favourably with the Government maps of most European states, and constituted a very real aid to the serious student in England. With this verdict I may say that I entirely agree. I am convinced that all archæologists have good reason to be grateful to the Ordnance Department.

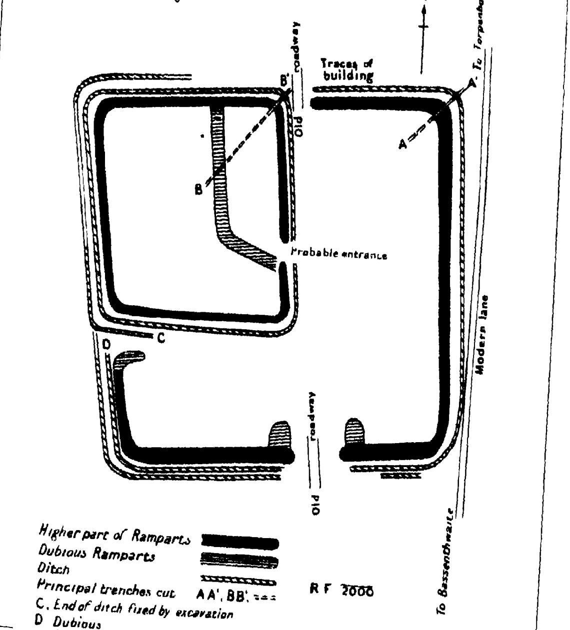
But while, in their general results, the exertions of the Ordnance Survey to include archæological matter have been attended with success, they are not free from an intermixture of less satisfactory elements. It is well known, and has often been urged by critics, that the Ordnance maps contain a good many archæological errors of omission or commission, and I wish here to offer a few remarks upon the less pleasing aspect of the Department's work. I do so because it seems to me that a discussion of the nature and kind of these errors may help the Department to remedy them, and, on the other hand, may guide the student to a right use of the existing maps. It will, therefore, be understood that I criticize, not because I consider the maps bad, but because they are worth improving.

The general cause of error in the Ordnance maps is the same which is responsible for so many errors in all parts of English life, the absence of trained and expert knowledge. The Ordnance staff, alike at Southampton and in the various districts under survey, is a staff of men who are by profession engineers, surveyors, cartographers. They are not, except by the purest accident, archæologists, and in handling archæological matter they pass beyond their proper province. That is inevitable, and no blame attaches to any one for it. But it involves, as a corollary, the need of some trained assistance to direct the surveyors in their treatment of archæological matter, and that need, I think, has not been always adequately recognized. I shall endeavour, in the following paragraphs, to illustrate the result by classifying the errors which have actually arisen, and by suggesting some steps towards a remedy.

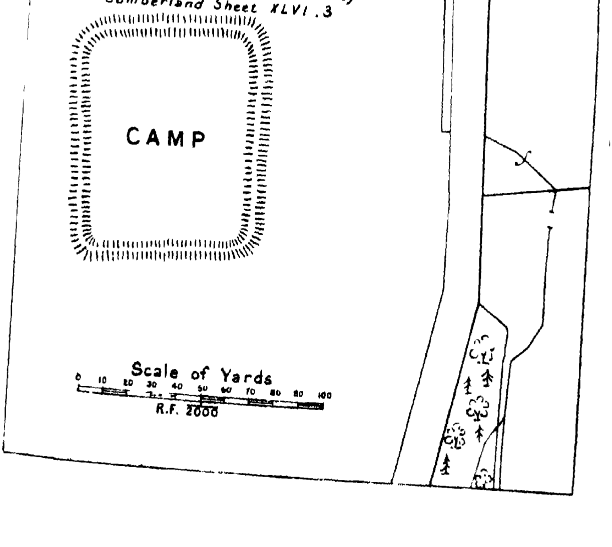
The errors to which I would invite attention fall into four groups. In the first place, archæological remains now visible on the surface are surveyed without archæological experience. In the second place, local information is not always adequately sifted. Thirdly, literary or printed evidence is admitted without being tested, sometimes in the

CAMP HILL, NEAR CAERMOT

From the Report of the Cumberland Excavation Committee for 1902. Page 331



From 25 Inch Ordnance Survey
Cumberland Sheet XLVI. 3



shape of incorrect titles or descriptions, and sometimes in the shape of measurements transferred bodily from book to map. Lastly, the symbols for marking remains are somewhat imperfect, especially in two respects—in the signs used to distinguish ditch and mound, and in those used for remains which are visible as contrasted with those which have vanished from the surface. The space at my disposal will permit me only to give instances of these groups of errors. A volume would be required to set out the whole available material.

First, the surveying of antiquities without expert knowledge. It is plain that no ordinary sapper, and, indeed, no ordinary surveyor, military or civil, can be expected to possess expert archæological knowledge. He cannot decide properly whether a ruin is Roman or mediæval, or whether a bank of earth represents an integral part of an ancient camp or a recently extinct hedgerow. He has not always the trained observation which will help him to observe that there is a ruin or a bank of earth to be noted. I will cite a couple of instances of what, in consequence, occurs. A little north of Bassenthwaite, in Cumberland, in the parish of Torpenhow (pronounced Torpenno), is a rectangular earthwork marked on the Ordnance map (25–inch, Cumberland, XLVI. 3, ed. 1900). This was partly excavated two or three years ago by some friends of mine and myself, and I am able to present a rough survey made at the time (*Cumb. and Westm. Archæol. Soc. Transactions*, New Series, iii. 331). A comparison of this with the Ordnance map will show at once that the latter omits nearly all the characteristic features of the earthwork. Indeed, the Ordnance plan is hardly recognizable as a plan of the earthwork in question. For a second instance I turn to the Roman wall, which reaches from near Newcastle to near Carlisle, and is a work of great and, indeed, of national importance. That wall is traceable with certainty for almost all its length, but at one or two points its course is for a brief space doubtful. The Ordnance surveyors, in some at least of their maps, have omitted long stretches of the certain portion, while they have inserted, as if well known, some of the more obscure or uncertain links. I do not blame the surveyors for this. But I cannot profess to consider the result satisfactory.

These are, I suppose, the unaided efforts of surveyors. Let us now take my second head—their efforts aided by local information. The Ordnance Department has used local aid very freely. In some cases the result has been excellent. In others it has been the reverse. It does not follow that because a man lives in a place, he knows anything about it. Any visitor to my own city of Oxford finds that out. Nor does it follow that because a man is a local amateur, he is therefore a scientific expert. The Ordnance authorities have been too apt to overlook these facts, and in consequence all manner of odd titles and odd items have crept into their publications—things that can be counted,

not by the dozen or the score, but by the hundred. Taunton shall give a typical instance. This city possessed at one time a local enthusiast by way of an antiquary and a mediæval bridge. The antiquary rechristened the bridge Roman, and so it stands to this day in the Ordnance maps, with two or three quite imaginary Roman roads inserted on the same authority close to it.

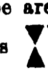
More often, however, the Survey has utilized printed books or maps. Names and titles, in particular, have been borrowed freely from county histories and county archæological societies' proceedings. Thus, for example, a good part of the forged 'Itinerary of Richard of Cirencester' has passed into the Ordnance maps, and much of it is there to this day. Thus, again, the now obsolete notion that most earthworks in our island are of Roman origin has been borrowed, and has, in the Government maps, lived a new life after it has died elsewhere. Thus some of the greatest follies of eighteenth-century writers, like Wood's about Roman Bath, have found their way into the largest-scale maps of the town, and remain to amaze the modern student. This class of error is, however, well enough recognized, and I desire only to point out one curious variety of it which has not, I think, obtained general notice.

When a cartographer has before him an incorrect map made by some predecessor of his, and transfers details from it to his own correct map, the initial incorrectness is not removed by all his care in transference or by all the accuracy of his own map. When, for example, a "Roman villa" is marked in some old map as 400 yards from four cross-roads (or other definite point), and is marked wrongly, the Ordnance Surveyor does not get the position correct by inserting the villa on his map at the same distance from the same point. He merely perpetuates the error. But he has often overlooked this. Over and over again he has relied on measurements made by antiquaries long years ago, and has thus made his own maps incorrect. I will take my example from the neighbourhood of Somerton, in mid-Somerset. Here a group of Roman villas was dug up about 1820–30 by a local archæologist, and an account published by a competent authority, Sir R. C. Hoare. This account contains a rough map, and the Ordnance draughtsmen have taken over the details from this map as they stand. Two years ago I tried, 6-inch map in hand, to follow out the sites. Some, I doubt not, were correct. Of others I should not venture to express an opinion, since the sites were grass-grown, and showed no traces of anything beneath. But others were unquestionably wrong. One I well remember, in which the Ordnance surveyors, following Sir R. C. Hoare's rough map, had put the "villa" on a steep slope where no house could stand, and on a spot furrowed by little rain-channels, where any remains must have been visible.

Again, the same Sir R. C. Hoare traced out a Roman road which he supposed to run from Old Sarum westwards along Mendip to the lead-

mines of Charterhouse, and further to the sea at Uphill. I do not profess to be sure at present whether this road existed or is only an antiquarian figment. For my purpose that does not matter. The noteworthy fact is that the Ordnance surveyors have inserted the alleged line of this road from Hoare's maps (Roman Wilts), and, so far as I can make out, have inserted it where no Roman road ever ran. With the 6-inch sheets in hand, I have tried to follow the line along Mendip, noticing especially the soils and stones in the ploughed fields, and questioning ploughmen, and examining points where open drains or other sudden depressions cross the Ordnance surveyor's line. In no single case could I find any indication of the road. This may not prove that the road did not exist. It does go towards proving that the road did not run where the Ordnance maps put it.

I will venture to add a third example. In the north of Cumberland there runs out from the fort of Amboglanna (Birdoswald, near Gilsland) on the Wall of Hadrian, a Roman road called Maiden Way. Its direction is north-west, and beyond all doubt it crossed the moors to another fort close to Bewcastle church. So far its vestiges, with some short intervals, are plain to the eye, or can be recovered by the excavators' spade. But theorists have imagined that it ran further north into Scotland, and Sir Walter Scott has immortalized the theory in one of his novels. In 'Guy Mannering' he makes Dandy Dinmont and Brown, starting from Gilsland, come upon "a sort of rugged causeway, the remains of an old Roman road which traverses these wild regions in a due northerly direction," and follow it across the border. In Scott's day this was mere theory. But soon after, a vicar of Bewcastle, Mr. Maughan, attempted to trace the alleged road north of Bewcastle, succeeded to his own satisfaction, and published an account, with a plan. This plan has been accepted by the Ordnance surveyors, and the line indicated on it has been transferred to their maps. I have endeavoured to trace it, by excavation and by local inquiries. The only result to which I have been able to come to is that the road never ran north of Bewcastle at all, and that both Maughan and the Ordnance surveyors have inserted a fictitious line.

I pass on to my fourth point: imperfection in symbols and signs. Here I wish to notice only two items. First, the symbols used for ditch and for mound are so much alike that it is often impossible to say whether a ditch or a mound be intended. In theory, the strokes which indicate a slope are supposed to be thicker at the top than at the bottom. Thus  indicates a depression, as of a ditch, and  a mound, as of a rampart. In practice, the distinction between the thick and thin ends of the stroke is constantly lost. I would defy any one to take the Ordnance sheet to which I have already alluded (Cumberland, 25-inch, XLVI. 3) and tell the true character of the

earthworks marked on it in respect of ditch and mound. I shall not be indiscreet, perhaps, if I say that the Director-General of the Survey has admitted his own inability to do so. Probably different symbols are needed for ditch and for mound, but that is a point which I cannot argue here. I am satisfied with pointing out that the symbols used in the Survey, and, indeed, in most plans of earthworks drawn in England, are defective in this respect.

A second imperfection arises from occasional failure to distinguish the certain from the uncertain and the visible from the invisible. No one, I think, who looked at the Ordnance representations of the Mendip road or the Maiden Way, discussed in the preceding paragraphs, would understand that both roads are wholly invisible, and both (to say the least) uncertain. Probably it might be desirable, in such cases, to explain the position by a slight addition to the letterpress, and to use terminology such as is used in case of invisible parish boundaries. The title of the road might then run "Alleged (or supposed) line of Roman road (defaced)." In many cases, of course, it would be wiser to omit uncertain and invisible roads. But sometimes the line of a buried ditch, or a lost road, may have been ascertained by excavation, or be otherwise known, and such cases would be met by the legend suggested above.

It remains to consider how the Ordnance Department could remedy or prevent such errors as I have instanced. I will venture two suggestions, of which the second is plainly the most important, and perhaps the most difficult to work out. In the first place, the Department might take steps to publish a summary of the sources from which it has derived its archæological information. The material exists ready to hand in the Ordnance "Name-books," and the country archæological societies would, I imagine, be ready to print it, each for their own district, if the Government were not willing to issue it officially. It would then be possible for the student to ascertain the value of a name without troubling himself or the Department by a special letter addressed to Southampton. Here, however, I may add a caution. I have occasionally asked the Ordnance Department to tell me the source whence it drew some special item of an archæological nature. The Department has always responded with the greatest kindness and courtesy, and I am deeply in its debt in this matter. But I have found that the sources given are not always correct. Where they are printed, no difficulty arises. But where the Department's reply has been that Mr. So-and-So and the Rev. ABC and Colonel DEF, resident in the district, have told the surveyors, the case is more complicated. For it is quite possible that I may write to Mr. So-and-So (if still alive), and receive from him the answer that he never said anything of the kind imputed to him, and does not take that view. I make every allowance for forgetfulness and change of mind, but I think that sometimes the

district surveyor himself may have erred or misunderstood. To meet such chances of mistake, it might be well that the department should ask for all archæological information in writing, and in publishing that it should quote the gist of the written testimony.

But it is still more important that the Ordnance Survey should bring itself into touch with these who may really be considered expert authorities on the various kinds of antiquities which are to be marked. It must obtain an advisory committee of the ablest men in the whole country. Local inquiries, of the best local archæologists, are good in their way. But they are, by themselves, wholly inadequate. In many districts there does not exist a competent local authority, whose opinion can safely be accepted about each of the various groups of antiquities which have to be included. A man may know much of Roman remains, without having any real acquaintance with mediæval abbeys or neolithic flints. Indeed, the case is worse than this. For, in the existing condition of English archæological studies, there are very few competent local authorities on any branch of knowledge, and in many districts there are none at all.

On the other hand, attempts are being made at the present moment to survey, catalogue and criticize the antiquities of our country. The 'Victoria County History' does much in this direction, and its efforts, I think, are courageous and valuable. As one of the contributors to the work, I am precluded from saying much about it. But I may be permitted to point out that many of its volumes contain *Catalogues Raisonnés* of the Roman antiquities found in various counties, and I understand that its aim is to treat the antiquities of other periods and also the earthworks in a similar fashion. The Earthworks Committee appointed in connection with the London Society of Antiquaries is also beginning what we trust may lead to a complete listing of earthworks and a correct survey of each "camp" or other remain that is worth surveying. It may not be easy to arrange collaboration between these and other attempts now in progress to catalogue and plan minutely our local antiquities. But it is obviously absurd, though it is not at all un-English, that independent efforts should proceed simultaneously towards the completion, several times over, of the same task.

I think that here perhaps the Geographical Society might help to promote unity. It numbers among its members both archæologists and cartographers, and stands, as it were, halfway between the mapmaker and the antiquary. It is, therefore, well fitted to initiate a movement for co-operation. It need not undertake to guide the movement, when once started. If it were to apply to the various bodies and the principal persons concerned, through a small committee, it might bring them together and work out, what I here make no pretence of doing, a true scheme for conjoint and scientific work which should be effective

After the paper, Colonel JOHNSTON said: I think we are very much indebted to Dr. Haverfield for having come here to read a paper on the subject, and I am sure that what he has said will be warmly welcomed by the Ordnance Survey. My successor, Colonel Hellard, the present Director-General, is here now, and he will be able to speak for the Ordnance Survey in that matter. The first point that I should like to make clear—indeed, Dr. Haverfield has already alluded to it—is that the Ordnance Survey is not an expert in archæological matters. All the Ordnance Survey can do is to get the best authorities it can on archæological subjects. When they take up the survey of a county, they first of all make local inquiry as to the archæological features to be found there; they then get the best authorities they can, and the rule is that no archæological height can be shown in the Survey map unless it is vouched for by authority which is considered good enough. Probably in some cases the Ordnance Survey has failed, in that they have accepted as authorities persons who really are not competent, but that seems to me unavoidable unless archæologists will come forward and assist the Ordnance Survey in the matter. The work of a division officer on the Ordnance Survey is very arduous indeed. Taking my own case, I was division officer for about six years, and during that time we carried out survey work in six different counties. Well, I think it goes almost without saying, that no officer can in six years get full archæological information in six or seven counties, or even find out who are undeniable authorities on archæological matters. But in the past the Ordnance Survey has undoubtedly taken very great pains to get the information as correct as possible. From Henry James downwards, all Director-Generals to my knowledge have taken the keenest interest in showing information as accurately as possible, and they have always welcomed the help of competent archæological authorities. What I should like to see, and I hope Dr. Haverfield's paper may conduce towards it, is that when the survey of a county or the revision of a county is taken up, some competent archæological authority should be recommended, we will say by the Society of Antiquaries, and placed in communication with the Ordnance Survey in order to assist them to show only what is strictly correct in their maps, and if this paper leads to anything of that kind, it will be a very valuable thing. If my memory does not serve me falsely, I think Dr. Haverfield has been kind enough to communicate to the Ordnance Survey various matters in connection with Cumberland, and I can assure you what he communicated was very cordially welcomed, and the Ordnance Survey was only too pleased to have his assistance, and I am perfectly certain that my successor, Colonel Hellard, will welcome any help that he may obtain also from other archæologists.

Colonel HELLARD: Dr. Haverfield mentioned that as a rule a surveyor is not an archæologist. The difficulty we have to contend with is that the archæologist is not a surveyor. And the difficulty exists because when the particular object is unearthed, as a rule there is no surveyor available; that is the main difficulty of absolutely accurately delineating these objects. It has happened that we have had information regarding it, and one has been able to send a surveyor some little distance to put it in accurately before the walls or whatever it is has been closed in, but that is very seldom possible. I ought to say that any antiquary who has applied to us—and I think Dr. Haverfield will bear that out—for maps on which he can record his information, they are always sent, and we are always very grateful to any archæologist of undoubted repute who will be kind enough to let us have the information he gets. It is impossible, in the short time that our men are in the country, for anybody to make a thorough study of the objects there, and, as Dr. Haverfield rightly says, the local authorities—well, they very seldom give us much useful information, but our difficulty is to get information as to the local

authorities who are competent, and short of referring to some central body in the first instance who can depute some one by name in that county, it is almost impossible for us to arrive at that. I ought to say, I think, that Dr. Haverfield has been very fair to the Ordnance Survey in his kind remarks. But as regards these ditches and mounds, I do not know exactly how his difficulty arises, because we have no difficulty whatever in showing cuttings and embankments on railways, and I thought there was no sort of doubt about these pecks used on mounds. The broader top of the peck represents the top of the slope.

Colonel JOHNSTON: I should like to add one thing I omitted to say in speaking—that is, in the case of Scotland we have had very considerable assistance of the kind I have indicated from the Society of Antiquaries. In one or two cases where we have been in difficulties, we have referred to the Antiquary Society of England, and they have given us the assistance we wanted. And that is what is wanted all over the country.

Mr. P. L. SCLATER: Might I say there are so many local societies and clubs now which devote themselves particularly to antiquarian matters, that I think there should be no difficulty in any county in applying to the Field Club. I know half a dozen at least who would, I am sure, be very glad to give information upon any subject of this kind.

Mr. I. CHALKLEY GOULD: Having had a considerable amount of experience in examining earthworks throughout England, I may say that I have had enormous assistance from the Ordnance Surveys. In my archæological attempts I have gone over the ground, and in many cases I have tested their measurements and found them absolutely accurate. My great difficulty with the Ordnance Survey has been, not to tell which is the top of a rampart and which is the foot, because I think the thickened shading at the top is sufficient indication, but the difficulty seems to be that the Ordnance Survey often leave out a foss. This camp shows a rampart; I see from Dr. Haverfield's plan it has a foss round. I think the Ordnance surveyor should be instructed to put a foss in if there is one. With regard to shading, I cannot but think it sufficient if they had instructions to emphasize the top stroke of the peck. There is another method, which is to make every alternate one shorter than the other; but I cannot help thinking that the present system is sufficient if it is done properly. Colonel Johnston has made a suggestion, and Colonel Hellard also, showing their difficulty in getting information. Well, I have the honour to act at the present time as hon. secretary of the Earthworks Committee, and we are in close touch with the Society of Antiquaries, and Dr. Haverfield is a member of our committee, and I don't think we should have any difficulty in putting the Ordnance Survey in touch with people who are competent to give information. People are really making a study more or less of these matters, and I may say this study is growing more and more in interest.

Mr. J. L. MYRES: It has been said quite justly that a great deal of misconception may arise from making use of local and superficial authorities. But of course there is another side to that; and I think a certain amount of amateur pressure has been put upon the Ordnance Survey Department to include just such information as Mr. Haverfield would have us avoid. We don't want to use the Ordnance Survey maps for recording all sorts of rubbish of that kind, if it can be avoided; but there have been cases in which a map has preserved indications (in the shape of place-names due to folklore and popular tradition) of sites which have otherwise become unrecognizable, and if it were possible to restrict the actual delineation on maps to traces of such objects as are recognizable, without sacrificing an occasional hint that this or that locality is worth searching for

other relics, it would be better. At the same time, maps are full of instances of that sort where a nickname has given rise to inquiry later, and has had profitable results.

Dr. HAVERFIELD: I do not think I have very much to say. I think possibly some advantage might be gained by the Ordnance Survey printing and publishing separately, through, say, the Society of Antiquaries or any other approved society, some of the archæological material they have collected which they have used for the purposes of their own maps. I think, also, that the better plan in dealing with the archæological evidence would probably be to have some sort of committee, not necessarily a local committee. I must repeat that I am not convinced that the local authorities are by any means the best people to apply to in the matter. Long ago an archæologist, a tolerably bad one, but still a man of repute in his own day, observed of a local authority that he "knows nothing outside his parish, and I know nothing inside." That almost represents the difference between the local and the expert archæologists in England and in Germany and most other places. The man who is, perhaps, in the best position to judge has not always the local knowledge to know that the thing exists at all. But the lesson to be drawn from that fact, or one of the lessons, is that the opinion of the local man must not be taken as final. It must be submitted to some further decision. I think, further, that some such committee as one composed of representatives of the Society of Antiquaries, might be found to be far more useful than mere application to the local societies, which, with all due deference to the work they do, contains a considerable proportion of visionaries. I should like to see improvement, with respect to marking mounds and ditches. If anybody would look at the Camp on that map (Ordnance Survey, 25-inch, Cumberland, XLVI. 3—exhibited at the meeting), and at another earthwork called the Battery, and at another earthwork called the Quarry, and would tell me how he is quite certain that the Quarry does not slope up that way instead of down that way, or if he is quite certain of the exact character of the earthwork which constitutes the so-called Battery, whether it consists of a mound and ditch or a mound or a ditch, I should feel obliged. Lastly, I do recognize the value of the work of the Ordnance Department, and the great help I have received in many cases from the authorities in my work, and I have brought these criticisms forward, not in any spirit of fault-finding in the least—that, I hope, has been recognized—but because I hope it may lead to some improvement of what is already very good.

The CHAIRMAN (Major DARWIN): I think I may, in the name of everybody here present, give a hearty vote of thanks to Mr. Haverfield for introducing this most interesting discussion. What struck me very much during this discussion was that we have two parties, the archæologists and the Ordnance Surveyors. The archæologists seem exceedingly willing to give help, the Ordnance Survey seem only too ready to accept it, and the only difficulty, apparently, is bringing the two parties together. There is one difficulty, I imagine, which has not been mentioned, and that is, the question of funds. But I feel sure that any work in connection with introducing better archæological results to the Ordnance Survey would, to a certain extent, be an expensive business. With regard to the work the Geographical Society can do in these cases, we sometimes can be useful as a kind of go-between to the two parties, and if we can be of any use in that way, if Colonel Hellard on the one hand, and the archæologists on the other, would communicate with us, I am sure we shall only be too glad to do anything we possibly can. I think Mr. Haverfield, by having brought this subject before us, and written a paper which will, no doubt, appear in our *Journal*, has done the best thing possible as the first step on this side of the subject, and I am very glad to hear the way in

which Colonel Johnston and Colonel Hellard seem ready to take advantage of the help the archæologists are ready to give. We are very much obliged to you, Mr. Haverfield, for bringing this interesting subject before us.

SURVEY WORK BY THE ALEXANDER-GOSLING EXPEDITION: NORTHERN NIGERIA, 1904–1905.*

By P. A. TALBOT, B.A., F.R.G.S., F.A.I.

In the spring of 1904 this expedition started for Lake Chad. A full account of the work done cannot, of course, be published until the return of Lieut. Boyd Alexander and Captain G. B. Gosling. It may, however, be useful to give a short description of the geographical work already accomplished, to explain the map published in this number of the *Journal.*

When the expedition arrived at Ibi, on the river Benue, the late Captain Claud Alexander and myself left the others, and proceeded to survey, as accurately as possible, the country between the Benue and Lake Chad, a great part of which was then entirely unexplored. Ibi was connected by a line of latitudes and azimuths with Munyi, in southern Bornu, *viâ* Bauchi and Gombe. From Munyi a rigorous traverse was carried across the plain of Bornu to Kuka. Two bases were measured for subsidiary pieces of triangulation—one near the Murchison range, to connect with the inaccessible Mount Madong and other peaks, and a second, near Bauchi, to fix various hills in the neighbourhood. The main connection, however, consisted in the line of latitudes and azimuths. For this, at least two north and two south stars were observed at each station for latitude, and no ray depends on less than three distinct observations for azimuth. Between points fixed in this way differences of longitude were obtained by three chronometers. For the traverse in Bornu, the distances were measured by a Chesterman's 300-feet steel tape, the angles were taken by theodolite, and frequent azimuths observed. The route on Lake Chad depends on sextant observations only.

As regards heights, Ibi was taken, from observations of two boiling-point thermometers and three aneroids, to be about 350 feet above sea-level. From this place heights were carried by theodolite vertical angles all the way, with the exception of a short distance at the end—Kwoiangia to Kuka—where differences were obtained by two boiling-point thermometers and two aneroids.

Aneroid readings were taken every day. Maximum and minimum thermometers were also read daily, until they were broken after four months' work.

Observations were taken at various places to determine the magnetic

* Map, p. 224.

variation. The longitude of positions on the map is adjusted according to the result of an occultation observed at Wase. As the longitude of Ibi will shortly be determined by the telegraph, and that of Kuka was fixed by the Anglo-French and Anglo-German Boundary Commissions, the survey can easily be fitted in between these two points. As regards orthography, great care was taken to get the correct spelling of names, according to the rules of the Royal Geographical Society.

Cary's 6-inch micrometer theodolite and Troughton and Simms' 5-inch micrometer theodolite were used.

The chief obstacle encountered was the great difficulty in obtaining food for the carriers, owing to the prevalence of a severe famine in a great part of the country. With a few exceptions the natives were most friendly all through. Doubtless our popularity with them, as well as with the carriers, who remained with us all through the work, was chiefly due to the great tact and firmness displayed by the late Captain Claud Alexander. The unsparing way in which he worked was probably a contributory cause to the fatal illness which led to his death at Fort Maifoni.

Lieut. Boyd Alexander helped in the sketch of Lake Chad, and traversed down the shore of the lake from the Yo river to Kaddai; and Captain Gosling sent in a sketch of the part of Lake Chad south of Kaddai, with other information about the Buduma. With the exception of this, no information beyond what was acquired by the late Captain Claud Alexander and myself has been incorporated in the map, though, of course, much more geographical information will be brought back, on their return, by the surviving members of the expedition.

MR. BARRETT AND MR. ELLSWORTH HUNTINGTON IN CENTRAL ASIA.

The following letter has been received from Mr. Ellsworth Huntington, dated "Keriya, Chinese Turkestan, October 9, 1905:"—

"The three months since last I wrote you have been spent in studying some of the river systems from Khotan eastward for 100 miles to Keriya. Other explorers have crossed them generally on east-and-west routes; I have been up and down some of them north and south. My chief aim has been the study of the possible effects of climatic changes, glacial and historical, on the surface of the Earth and on life, but other things have also come in for a share of attention.

"The resemblance of the Tarim basin to a sea becomes increasingly striking as one knows the region better. Indeed, except for the accident of the absence of water, it is a sea, a genuine Mediterranean. On every side, so far as I have seen or read, the mountains appear to

have been lifted up in the form of plateaus rather than as individual ranges. To the west the uplift took the form of a huge monocline; to the east, in some places at least, such as Polu south of Keriya, it became a sharp fault. And here, as on the edges of other sharply depressed seas like the Mediterranean and Caribbean, there are evidences of volcanic activity in times no farther distant than the early part of the glacial epoch.

"Except for the action of the wind in depositing loess upon the southern mountains, deposition within the basin resembles that in a sea almost as much as the form resembles that of a sea. The result is that perhaps the most marked physiographic characteristic of the Tarim basin is its division into concentric belts resembling those on the shore of the ocean. To carry the analogy farther, the waves of sand, reddish in the central parts of the desert, whiter or grayer toward the edges, resemble those of a sea, as every one knows. The resemblance is increased when the thick dust haze utterly destroys all sense of perspective or distance, and, on a cool fall morning, for example, not only looks, but feels like a fog at sea. On the edge of the lifeless expanse of waves, tamarisk mounds 10 to 30 feet high, like great boulders capped with seaweed, are being overwhelmed by a tide of rising sand which appears to be blown in from the desert in response to a gradual drying up of the rivers. Further toward the mountains the jungle of tamarisk and poplars, and the reedy expanses of the oasis belt lie like green tide-flats between the main ocean and a broken strip of sand lagoons. Still farther from the main sand desert the lifeless gravel belt, like a huge shingle beach from 5 to 20 miles wide, completes the analogy.

"Evidences of the increasing desiccation of Central Asia during historical times seem to be widespread. For the last six weeks I have been studying the ruins of the Dandan-Uilik region and the river-system which appears once to have supplied them with water. The extent and number of the ruins is considerably greater than we were previously aware of, from Dr. Stein's excellent description. I found three new sites, and discovered that even Rawak, the most eminent of the old towns and the one farthest out in the desert, was the centre of a considerable agricultural population. At present four streams from the mountains support a line of villages on the southern edge of the desert. Farther northward in the scrubby jungle, along each of the lines where the streams would flow if they were large enough, lie the sites of one or two ancient villages. Still farther away, in the sand where the four streams would meet and become one river if the water-supply were yet more increased, there are two even older sites, each surrounded by a considerable area once under cultivation. If we take the line of the Dumuka stream, Stein's Domoko, we have, along the line which a single stream would follow if it were

large enough, a modern village, and four, possibly five, sites of former villages. The deserted villages, according to Dr. Stein, were abandoned approximately in 1840 A.D., 1300 A.D., 800 A.D., 300 A.D. (?), the sites being successively older as one goes farther into the desert. The 1840 village was abandoned because, after a number of years of increasing drought, no water reached the village for seven years during the winter, and the supply in summer was so scanty as to cause suffering. Wells had to be dug, and field after field abandoned. Finally the whole village moved at one time to the sandier soil farther upstream, where the water had had less opportunity to become lost in the ground. A well-known tradition assigns the same cause to the abandonment of the more remote village of 1300 A.D., or whatever the date may be. Historical records prove that this village was conquered and sacked at the time of the Mohammedan invasion, but was not abandoned in spite of the calamity, although the inhabitants of some of the neighbouring villages fled northward. There is strong reason for believing the tradition to be founded on fact. The 800 A.D. and 300 A.D. villages do not appear to have been abandoned because of wars or calamities, as appears from the care with which almost everything of any intrinsic value was removed. It is not improbable that they too may have been abandoned because of increasing desiccation. The large areas of dead jungle and scrub here and elsewhere support this hypothesis, for even if the towns were abandoned by reason of wars or calamities, their previous water-supply would be disseminated somewhere in the region, and would support the ordinary vegetation of the desert border. The frequent presence of dead jungle in places where human agency appears to have played no part either in bringing or diverting the water-supply, is even more significant. The facts which have just been outlined, and others like them, are not yet sufficient to prove the gradual desiccation of Central Asia during historical times, but they at least add a keen interest to the further study of the question which I mean to carry on further east.

"Mr. Barrett and I have now finished our work together, and are conducting separate expeditions. He expects to remain on the southern border of the Tarim basin for some time longer; I expect to spend the winter in the Lob Nor region, and to reach Turfan in the spring."

LONGITUDE BY TELEGRAPH ROUND THE WORLD.

With the opening of the Trans Pacific cable in 1903, it became possible, for the first time, to obtain the telegraphic difference of longitude between San Francisco and Manila by way of Honolulu and the islands of Midway and Guam, and thus complete the circuit of the Earth. In anticipation of the opportunity thus afforded, the United States Coast

and Geodetic Survey lost no time in making preparations for this important work, and by December, 1903, the matter was taken in hand in earnest, Mr. Edwin Smith of this survey being entrusted with the arrangements.

First of all, the instruments and apparatus for automatically recording the signals had to be carefully considered. A method had been successfully employed by the Canadian and English observers in determining the difference of longitude between Greenwich and Montreal in 1892, and, Mr. Smith having obtained particulars of this, similar recording apparatus was constructed at the Coast and Geodetic Survey Office, and was found to be entirely satisfactory throughout the operations.

Mr. G. C. Ward, vice-president and general manager of the Commercial Pacific Cable Company, entered heartily into the project, granting free use of the cable, and issuing instructions to the superintendents at the various stations in the Pacific to render all the assistance in their power.

Mr. Smith had as his colleague in this undertaking Mr. Fremont Morse, also of the United States Coast and Geodetic Survey, and everything being ready, the first section of the work, that between San Francisco and Honolulu, was completed without much difficulty. Observations were taken and signals exchanged first in April and then in June, the interval between the dates being due to the time necessary for the exchange of observers.

As there seemed a possibility of getting signals through direct between Honolulu and Guam without using the intermediate station at Midway island, it was considered worth while to make the attempt, especially as the latter is not easily accessible; and with this object, Mr. Smith started from Honolulu, and arrived at Guam on July 14. Here, however, many difficulties were met with, and it became evident that no satisfactory signals between Honolulu and Guam, with the cables joined at Midway, could be obtained, except, possibly, by the use of a voltage so great that the cables would be endangered, and reluctantly the idea of leaving out Midway island station had to be abandoned.

The next section to be undertaken was that between Guam and Manila, and, Mr. Morse having proceeded to the latter place, the difference of longitude was determined between September 8 and 16. Owing to difficulties of transport between these two places, an exchange of observers was found to be impossible.

There still remained the sections between Guam and Midway and Midway and Honolulu to be connected to complete the work, and after many delays, owing to transport difficulties and bad weather, Mr. Morse reached Midway early in November, and the longitude determinations between Midway and Guam were made during the latter part of

that month and the early part of December. Subsequently, Mr. Smith having returned to Honolulu, the last section, between Midway and Honolulu, was completed during February and March, 1904.

In his account of these operations,* Mr. Smith gives most interesting particulars and details, from which it is clear that every effort was made to render the results as accurate and complete as possible, special attention being paid to personal equation and other refinements. The following is a table of the final results in longitude, together with the probable error :—

	h. m. sec. sec.
Honolulu transit, west of Greenwich	10 31 27·732 ± 0·056
Midway transit, west of Greenwich	11 49 30·952 ± 0·057
Guam transit, east of Greenwich	9 38 35·466 ± 0·058
Manila transit, east of Greenwich	8 3 52·202 ± 0·059
Manila cathedral dome, east of Greenwich	8 3 52·426 ± 0·059

These results depend upon the longitude of the transit at San Francisco (1903) being $8^h\ 9^m\ 48^s{\cdot}809$, with a probable error of $\pm\ 0^s{\cdot}055$, which is the result of previous trans-continental triangulation and telegraphic connection with Greenwich.

The actual differences of longitude between the Pacific stations were found to be as follows :—

	h. m. sec sec
Honolulu transit, west of San Francisco transit ...	2 21 38·923 ± 0·008
Midway transit, west of Honolulu transit	1 18 3·220 ± 0·015
Guam transit, west of Midway transit	2 31 53·582 ± 0·010
Manila transit, west of Guam transit	1 34 43·264 ± 0·010

At the end of his report Mr. Smith gives an interesting account of the previous determinations of longitude through Europe and Asia to Manila, and it is instructive to compare the results of these earlier determinations with that now obtained quite independently by the western route and the new Pacific cable. The longitude of Manila cathedral dome had been telegraphically obtained previously by two different lines - *viâ* Russia and Siberia to Vladivostok, and by the southern line through Persia and India. The first gives $8^h\ 3^m\ 52^s{\cdot}697 \pm 0^s{\cdot}157$, and by the second, $8^h\ 3^m\ 52^s{\cdot}238 \pm 0^s{\cdot}061$. The longitude accepted by the United States Navy previous to the recent determination, depending on Madras being $5^h\ 20^m\ 59^s{\cdot}42$, was $8^h\ 3^m\ 52^s{\cdot}42$ E., which differs only by $0^s{\cdot}006$ from the result recently obtained by the Pacific route. This must be considered a most remarkable agreement.

In addition to a great deal of tabular matter and descriptive text, Mr. Smith, in his report, gives full-page plates of the observatories erected at the different stations, as well as of the instruments and automatic recording apparatus used. There is also a sketch-chart showing the position of the stations.

* Appendix No 4 to U.S. Coast and Geodetic Survey Report for 1904

CLIMATIC FEATURES OF THE PLEISTOCENE ICE AGE.*

By Prof. ALBRECHT PENCK.

UNTIL now, the climate of the Pleistocene Ice Age has been studied mostly from a very theoretic point of view. There have been discussions as to how astronomical changes would influence terrestrial climate; how far changes of the position and inclination of the Earth's axis, how far changes in the eccentricity of the Earth's orbit, would influence the distribution of warmth on the Earth's surface. Investigations have been made as to what climatic changes must be produced by changes in the actual distribution of water and land, of the present winds, of the heights of the land, of the composition of the air, and so on, but it cannot be said that any one of these theories is sufficient to account for the real climatic conditions of the Pleistocene Ice Age. In order to arrive at a solution of this important problem, another method can also be adopted: we can try to draw conclusions as to the climate of the Ice Age on the base of observations; we can try to recognize the bearing of geological facts on climatic conditions. Physio-geographical research promises, therefore, some elucidation on the problem, and already allows us to arrive at certain conclusions.

The development of the glaciers of the Great Ice Age affords no direct means to understand the climatic conditions of this period, for glaciers depend not only on climatic conditions, but also on orographic forms. We find very small glaciers sometimes in high latitudes, where the country is not mountainous; on the other side, a very considerable development of glaciers in lower latitudes—for example, in the Himalayas—is due to the existence of a mountain chain. The climatic conditions of the development of glaciers can be best recognized by the elevation of the snow-line above the sea, and in late years one prominent task of glacial geology on the continent has been to determine the elevation of the snow-line during the glacial period. There are many ways of determining this; the glaciers themselves afford them—they begin in the *névé* region, and terminate below it. The mountains, which feed glaciers, rise above the snow-line, and the tongues of the glaciers end below it. The snow-line lies always between the two ends of a glacier: it lies above the region of morainic accumulation, for this is going on only where glaciers are melting away—that is, along its tongues; it lies above those summits which have had no glaciers. By paying attention to all this, it becomes possible to determine the elevation of the glacial snow-line in pretty narrow limits—to, say, less than 300 feet.

In Central Europe most of the mountain groups had glaciers during the Ice Age; the glacial snow-line, therefore, was depressed to an elevation of 3000 feet and less. In the west it lay lower than in the east; the mountains of Wales produced a considerable glaciation in the same latitude in which the Ural mountains were not glaciated at all. The snow-line of the glacial period descended towards the ocean, and ascended towards the centre of the continent, as is the case with the present snow-line. This points to the fact that during the Great Ice Age Central Europe was in the neighbourhood of the sea. In the Alps the glacial snow-line was more elevated in the central parts than in the peripheric regions; it arched over the mountains. The same happens at present, and there is a marked parallelism between the actual and the glacial snow-line, the latter lying from 3600 to 3900 feet below the former. In Southern Europe there are conspicuous

* Read at the South Africa Meeting of the British Association (Section E), August, 1905.

irregularities in the elevations of the glacial snow-line. On the west coasts of the three southern peninsulas it lies very low, in some places at an elevation of only 4000 feet, while it rises very much towards the centres of the peninsulas, where it is met with in elevations of above 6000 feet.

This arrangement of the glacial snow-line reveals to us some of the climatological circumstances of the glacial epoch. There is always a considerable depression of the snow-line in mountainous regions which stretch across the direction of the prevailing winds. The very remarkable depression of the glacial snow-line along the western flanks of the southern peninsulas of Europe therefore indicates prevailing westerly winds in the northern part of the Mediterranean sea during the Great Ice Age, in the same way as the depression of the actual snow-line on the coasts of Patagonia, New Zealand, and Alaska depends on the westerly winds there. After all, probably these westerly winds did not extend so far north as to reach the rim of the large ice-cap which covered Northern Europe; this ice-cap must have been accompanied by a barometric maximum, which caused easterly winds along the southern frontier of the ice. Thus we have to assume in the middle parts of Central Europe eastern winds, and during the Ice Age the arrangement of the winds in Central and Southern Europe must have been nearly the same as that found by the different Antarctic expeditions at the border region of the actual Antarctic ice-cap. There are also some indications that the realm of the easterly winds was subject to seasonal changes.

South of the Alps we find only indications of prevailing westerly winds; north of these mountains, however, there are traces of westerly winds as well as of easterly ones. Many of the minor features in the old glaciation of the eastern Alps are consistent with westerly winds, which caused heavy accumulations of snow on the west sides of the mountains, whilst smaller glaciers came into existence on the eastern slopes, which seem, therefore, to have been sheltered. On the other hand, we find on the north foot of the Alps a deposit which is nearly totally absent from the basin of the Mediterranean, and which is evidently deposited by easterly winds—that is, the loess.

There have been many discussions on the origin and the age of the European loess, and since it has not been sufficiently studied as a whole until now, there are still at present many diversities of opinion about it. Originally, it has been taken as a deposit of the highly swollen rivers of the Ice Age, but it can easily be shown that it reaches far above the highest waters of the Pleistocene epoch. Then Baron von Richthofen advanced his ingenious hypothesis on the origin of the loess as a continental deposit of a dry climate; but the whole arrangement of the European loess is not consistent with its deposition in interior basins. Many facts, however, make it sure that the loess is an æolian deposit, and that it is the river mud of the Pleistocene epoch blown off and redeposited by winds. There is always a certain relation between the accumulation of Pleistocene river gravels and river sands and the loess, and along the Austrian Danube the loess lies west of the former, being blown by easterly winds to its actual position. Thus, near Vienna we have the sandy plain of the Marchfeld along the Danube, and west of it the slopes of the Bohemian peneplain are covered up to a considerable height by loess, which originates in the sand-dunes of the Marchfeld.

There has never been the least doubt about the Quarternary age of the loess, and as long as there were only known traces of *one* glaciation, it was thought that the loess would be a deposit of this age. But when the traces of different glaciations in the Alps and in Northern Germany were discovered, doubts arose about the contemporanity of the loess and the glaciations, for the stratigraphical position of the loess is an interglacial one. It extends above the moraines of the older

glaciations, but does not enter the region of the last glaciations except at some places, where an evidently younger loess has been found. At a few places loess is met with between the moraines of two successive glaciations. But it must be borne in mind that the loess does not form a unit deposit. In larger sections of the loess districts along the Danube we observe that there are different layers of true sandy loess separated by decomposed surfaces of decalcified loess. The highest layer of undecomposed loess never extends to the morainic districts of the Alps, and its stratigraphical position as to the glaciation cannot be settled. Its palæontological and prehistoric remains, however, point to a glacial age; its fauna is the same as that of some later glacial deposits, and the palæolithical implements in it have close resemblance with those of the Magdalenian Age, which is post-glacial in comparison with the maximum of the last glaciation. This youngest loess along the Austrian Danube is possibly contemporaneous with the maximum of the last glaciation of the Alps, and it may be regarded as the mud of the glacial rivers, carried on by eastern winds to the neighbouring western heights and deposited there. Further investigations must show how far this way of reasoning can be extended over other loess deposits. It may be mentioned only that the European loess, taken as a whole, appears as a border formation of the great northern glaciation; it follows its southern rim from Southern Russia to the Straits of Dover, and extends southward only into the basins of the Danube, the middle Rhine, and the upper Rhone, which were invaded to a certain extent by Alpine glaciers. Its occurrence close to those Alpine glaciers, which reveal the influence of westerly winds, may be due to seasonal changes of the winds. During the summer the westerly winds may have had a wider realm than during the winter, as is now the case in the Antarctic Regions, where the east winds are the strongest in winter, when the atmospheric pressure is highest on the ice-cap.

The situation of the glacial snow-line helps us also to conceive the general character of the European vegetation during the Ice Age. There is always a certain vertical distance between the tree-line and the snow-line on the Earth, and we must assume such a distance also for the glacial periods, for above the snow-line the duration of the snow-covering of the country being the whole year, there must be below it a zone in which the snow-covering lasts too long for the development of trees. We can expect them only at a certain height below the snow-line. At present this height is least at those shores where the snow-limit is very much depressed, and is reduced at Alaska and at Patagonia to 1500 feet, while in the Alps it is 2500 feet, and in Central Asia 4500 feet. It can be observed that the distance between snow-limit and tree-limit is less in moist oceanic than in dry continental climates. Its amount, therefore, during the glacial period may help us to recognize if the latter was more a period of increased moisture or of altered temperature.

Palæontological researches, carried on especially by Mr. Nathorst, have shown that during the Ice Age an Arctic-Alpine flora was spread over Central Europe, and researches in plant-geography require that once the Arctic and Alpine floras were united on the soil of Central Europe. Therefore we have full certainty that during the Ice Age this country lay above the tree-line, the distance of which from the snow-line cannot have been less than it is now—that is, 2500 feet, in round figures. From this we conclude that the Ice Age in Europe did not develop under an oceanic climate with a considerable augmentation of precipitation, but that it was due to a change of temperature.

This conclusion is in harmony with another one, at which we arrive when we study the very roots of our Alpine glaciers. There are two ways which account for the increase of a glacier: either an increase of precipitation—then it becomes at first thicker above the snow-line; or a decrease of temperature—then it thickens at first

below the snow-line, the latter being depressed in both cases. If we compare the height reached by the Alpine glaciation near to its centre with the height reached by the actual glaciation, we shall find that the surface of the old glaciers did not reach above that of those of the actual glaciers in their *névé* region. Therefore, if the glaciation of the Ice Age should be derived from the actual one, the latter must get thicker below their snow-line; that is, the glaciation of the Ice Age will be arrived at if a decrease of temperature takes place.

Such a decrease of temperature need not be a very great one, for we see that under actual conditions little changes in the amount and distribution of temperature are quite sufficient to produce a rather great change in the situation of the snow-line. As we have already remarked, the present one arches over the Alps. In the northern parts of this mountain chain it is found at a height of 7200 feet; in the interior it rises to 9000 feet and more, and we find here in the Œtztal mountains, forests of the arve (*Pinus cembra*) at heights which come near to the snow-line in the Bavarian Alps.

Thus at present in the Alps one-half of that depression of the snow-line can be seen which caused the glaciation of an Ice Age, when we go from the interior chains to the border region, and the climatic changes which take place at present in the Alps at a level of 7200 feet are sufficient to account for one-half of the depression of the glacial snow-line. These changes are very slight as to temperature, the range of the latter being in the interior of the mountains more continental, at the border region more oceanic. They are larger as to precipitation, the amount of which is less in the interior than at the margin region; but a comparative study of the two factors shows that an important part of the actual depression of the Alpine snow-line is due to a slight diminution of the summer temperature.

Thus we are entitled to assume that a rather slight decrease of the annual temperature—say 2° 3° C.—if it is connected with a diminution of the summer temperature, will cause an Ice Age. Such a decrease of its side will cause also changes in the amount, and especially in the distribution of precipitation, and the glaciations themselves will influence the climatic conditions by producing changes in the distribution of air-pressure, as we have already seen, and by causing alterations in the isothermic lines. Thus the problem of the climate of the glacial period is a very intricate one. We have to deal with initial climatic changes, which produced the glaciations, and sequential ones, which were produced by the glaciations. As far as we know, the initial causes have been effective over the whole globe, for we find in all mountain chains, which have a sufficient height, a depression of the snow-line; the sequential changes, however, are only there displayed where we have to deal with very large glaciations, such as came into existence on both sides of the Atlantic, in Northern Europe and in North America, where the whole distribution of air-pressure was influenced.

It is an important field of future investigation to determine how far the initial climatic changes have influenced the distribution and air-pressure, and how far the latter are determined by sequential changes. The favourite working grounds of glacial geology do not afford good evidence in this direction, since the large ice masses which once covered Northern Europe and North America have caused such strong sequential changes. In order to solve the problem which we have mentioned, we must go to those regions which during the Ice Age were not extensively glaciated. I believe that we may expect some results in this direction from further exploration in South Africa. I believe that we may find there, besides the traces of the Permian Ice Age, also those of the Pleistocene times, corresponding to the great glaciations of Northern Europe and North America. The depression of the glacial snow-line which is known in Europe has been already recognized on

the high volcanoes of tropical East Africa, in the south island of New Zealand, in the Australian Alps, and Tasmania. We shall expect, therefore, to discover also traces of it in South Africa, if we go high enough into the elevated regions, as, for example, the high Drakensberg in the frontier region of Natal and Basutoland.

There seems to be no doubt that South Africa has experienced some very important changes, which seem to be the equivalents of glacial times. In his very remarkable book on the Kalahari, Passarge points out how this desert region shows many traces of a former pluvial period, which he correlates with the Pleistocene glacial period of the northern hemisphere, and besides this, that very able and sharp observer finds also traces of former desert conditions in the same and neighbouring regions. Unfortunately, there are only a few fossils in that Botletle formation which afforded proofs of repeated desert and humid conditions to Passarge, and since the subjacent layers are formed by very old rocks, there remains, therefore, a vast range in their possible age. Passarge tries to settle this by a comparison of the events which have taken place in the Kalahari with those which he assumes to have taken place in Egypt, according to Blanckenhorn's observations, and he arrives at the conclusion that the great climatic changes of the Kalahari region belonged to the Tertiary period. This conclusion seems not to be perfectly strong. It is not consistent with the fact that the few fossils which Passarge brought home from the Botletle formation belong to actually still existing species of fresh-water shells, for we generally observe that Tertiary layers contain extinct species. The organic remains of the Botletle formation point rather to the Quarternary age of the deposit than to the Tertiary, and, at all events, they are not unfavourable to a comparison of the climatic changes which Passarge proved at the Kalahari with those which are proved by the study of the Pleistocene deposits of Europe and North America. There can be no doubt that both continents have had not only one glaciation, but that there has been a succession of pluvial and interglacial epochs, forming altogether one great Ice Age; and it seems not to be improbable that the dry periods, which are proved by Passarge in the Kalahari, correspond to interglacial periods, while his limestone formations, which point to a moister climate, are equivalents of the glacial epochs of the Great Ice Age of the northern hemisphere.

Passarge's standpoint is different. He compares only his last pluvial period with the great Pleistocene Ice Age, but he assumes some interpluvial periods in it, which might be compared with interglacial epochs. But those interpluvial periods are only indicated by very slight evidence, and I should be inclined to compare them rather with the interstadial epochs, which interrupted the retreat of the last Alpine glaciation. Perhaps the peculiar form of the Victoria falls of the Zambezi is connected with those minor climatic changes which have happened since the last glacial period. We have below the fall a series of broader rents, connected by narrow gorges. Perhaps the latter were formed in times when the Zambezi had little water, while the broader rents would correspond to times when the river was as rich in water as at present.*

In a very convincing way, Passarge shows us that since the last fifty years the desiccation of the Kalahari has made considerable progress; how some lakes—as, for example, the very well-known lake Ngami—have disappeared, and many river-

* After the visit of the British Association at the Victoria falls of the Zambezi, I had the opportunity to make a detailed study of the falls and the neighbouring regions I convinced myself that the formation of the chasms below the falls is in no connection with climatic changes, but only due to the internal structure of the basalt-sheet, in which the river has cut.

beds have become dry. These facts have their counterparts in Europe. Since fifty years all our Alpine glaciers are retreating, and some shorter advances which have been observed now and then, have not prevented our glaciers from being now reduced to a state which they had four centuries ago. The very close parallelism of the events going on now in the northern and the southern hemispheres point to a common origin, and this seems to be, that by a very slight increase of temperature, the ablation of the Alpine glaciers and the evaporation in the interior of the continents are augmented, and that, therefore, here rivers and lakes, there glaciers, partially or totally disappear.

The actual coincidence of the recession of the glaciers which is nearly everywhere observed, and the desiccation phenomena, which are not only met with in South Africa, but also in the interior of Asia, seems to indicate that interglacial periods in the temperate regions are the equivalents of the reinforcements of desert conditions in the interior of the continents, whilst the glacial epochs correspond to the pluvial epochs, whose traces are so ably pointed out by Passarge in the Kalahari, and by others in the Sahara and the interior of Asia. There seems to have been repeated changes of all the climatic regions of the Earth during the Great Ice Age; glaciers came into existence where now there are rivers, and rivers have been at work where now deserts exist, and *vice versâ*. All these changes can be accounted for by the assumption of slight variations of the surface temperature, for temperature is a very efficient factor in the ablation of the glaciers and the evaporation of water over the land-surface of the Earth.

REVIEWS.

EUROPE.

Central Europe.

'Historische Geographie von Mittel-Europe.' Von Prof. Konrad Kretschmer. München und Berlin. 1904.

This volume forms the Fourth Part of a 'Handbuch der Mittelalterlichen und Neueren Geschichte,' edited by Professors Below of Tübingen and Meinecke of Strassburg. Opening with an elaborate survey of the physical geography of Central Europe (pp. 25–136), the present study next gives us a sketch of the political and social geography of the same regions in Antiquity (pp. 137-147, 148–163). This again is followed by "Politische Geographie" and "Kultur Geographie" at the close of the first Christian Millennium, in the later fourteenth century (about 1375), in the middle of the sixteenth and seventeenth centuries (1550 and 1650), and about 1770 (pp. 164–405, 408–628). Under "Political Geography" each of the states of Central Europe is separately passed in review: thus, under the survey of 1375, the bishoprics of Worms and Speier, the duchy of Bar, the "Lesser Territories" of Lorraine, and every tiniest political entity of Old Germany is dealt with separately. Under "Kultur Geographie" German colonization, the conditions of the towns, forest lands, and hill regions, the state of commerce and industry, including mining and metal working, and the indications afforded by place-names, especially, occupy the author's attention. A peculiarly interesting chapter (No. viii., pp. 406–437) is given to the Ecclesiastical Organization of the Mediæval Period in Central Europe. To every chapter, and to

each important section of every chapter, a bibliography of the most exhaustive character is assigned. Both in the conception and execution of his treatise, Prof. Kretschmer has shown the hand of a master, and no serious student of the history and geography of Germanic Europe can afford to dispense with the work, which is indeed a worthy example of Teutonic scholarship and thoroughness, equally remarkable for thoughtfulness of method, for clearness of exposition, for close accuracy of statement, and for suggestiveness of remark.

C. R. B.

Northern Russia.

'Travels of a Naturalist in Northern Europe. Norway, 1871; Archangel, 1872; Petchora, 1875.' By J. A. Harvie-Brown. Two vols London · J. Fisher Unwin, 1905.

These two volumes are filled with matter of considerable interest to the naturalist, and more especially to the ardent ornithologist, but there is not so much in them that concerns the geographer. Thirty years have elapsed between the penning of the author's journals and their publication, and this in a measure deprives them of freshness and novelty. During that lapse of time other naturalists have visited these Arctic realms of Russia in Europe and Siberia, and published their later experiences; none of them, however, have surpassed Mr. Harvie-Brown in thoroughly honest ornithological work and faithful record. The most extended of the three journeys described, and the most interesting, is that in which the author, in company with the late Mr. Seebohm, made to the Pechora river in 1875. The long winter route from Archangel to Ust Zylma, on the Pechora, the breaking up of that frozen river, the advent of the migratory hosts of birds, the summer navigation of its waters to the delta, and its outflow into the Arctic sea, are all described with painstaking accuracy, whilst the author's careful observations on the animal life met with, and descriptions of scenery, leave nothing to be desired.

'Epic Songs of the Pechora Region.' By N. Onchukoff (*Memoirs* of the Russian Geographical Society: "Ethnography," vol xxx. 1904)

The Pechora region is, perhaps, the portion of European Russia which is the least touched by modern civilization. In their religious ideas its inhabitants stand exactly where their grandfathers stood in the seventeenth century, when they split off from the official Church of Moscow. Even in their dress they have retained, to a certain extent, the old brocade costumes of the old Boyars, which one sees now only in the museums. It was, therefore, to be expected that the ethnographer would find in this region a rich crop of interesting folklore, as also epical songs. This is, in fact, what was found by the author. Bards who recite epical songs are still pretty numerous in the villages. They are kept in great respect by the population as the keepers of antiquity, and they are listened to with delight, especially during the long autumn and winter nights, when the chief outdoor work, fishing, has to be given up. The collection of M. Onchukoff contains some songs which are new, and some interesting new readings of the chief well-known epic ballads.

ASIA.

Tibet.

'The Great Plateau.' By Captain C. G. Rawling. London: E. Arnold. 1905. *Price 15s. net.*

This book gives a plain well-written account of two journeys in Western Tibet. The first was made in the summer of 1903, and the second after the conclusion of

the Lhasa Treaty in 1904, the two together adding very materially and usefully to our knowledge of the western portion of the great Tibetan plateau, and especially of its cartography. Captain Rawling is one of that type of British officers who enjoy nothing so much as putting themselves into the most uncomfortable positions, and pushing into the most inhospitable regions on the Earth. And where else could a more desolate and uninviting region than the great Tibetan plateau be found? Captain Rawling's book speaks eloquently of its inhospitality; of the dreary desert plains and barren hillsides; of the scarcity of fodder, which caused the death of eighteen out of twenty-four ponies in a few days; of the scarcity of water, which necessitated the digging of temporary wells; of the raging winds and piercing cold—such cold that even in August there were 18° of frost; and, lastly, of the churlishness of the Tibetan authorities, who drove away the travellers from all inhabited places, and kept them in the most dreary districts of the country.

And yet Western Tibet evidently has some luring charms in it; the vast expanses of unbroken plain, the mighty snowy ranges, the blue sky,—all these attract the traveller. "Tibet," says Captain Rawling, "has an irresistible fascination for the man who has once travelled in the country, and though one is always delighted to leave the discomforts and hardships inseparable from exploration, and to revel in the delight of civilization again, yet before many months have passed the longing to see it once more returns with redoubled force."

On his first journey Captain Rawling was accompanied by Captain Hargreaves, and he had with him the sub-surveyor of the Survey of India, and was furnished with a theodolite and plane-table. He was therefore able to map some 35,000 square miles in the north-western corner of Tibet, between Rudok and the Kuen-lun mountains, and connect with the surveys of Deasy, Sven Hedin, Bower, and Wellby.

In his second journey he was accompanied by Major Ryder, R.E., Captain Wood, R.E., and Lieut. Bailey, and the two survey officers made a full and accurate survey of the whole route from Gyantse and Shigatse, up the Bramaputra to its source, thence to the Mansarowar lake and Gartok, and back to Simla by the Shipki pass.

Such expeditions cannot be carried out unless the leaders possess tact in dealing with the strangers they find themselves amongst, and a capacity for making those Asiatics whom they employ work loyally with them. The account of Captain Rawling's dealing with the Tibetans when they opposed him shows that he possessed the first of these requisites; and it is satisfactory to read the handsome acknowledgment he makes of the services rendered by his followers, and of their doggedness in overcoming apparently insuperable obstacles.

It is also a matter of congratulation for us that the Tibetan authorities have now completely reversed the obstructive attitude they assumed to Captain Rawling in 1903. In 1904 he was assisted everywhere by Tibetan officials, and in 1905 a British Deputy Commissioner from the United Provinces was cordially received by Tibetans at Gartok.

F. E. Y.

AFRICA.

Abyssinia.

'The Source of the Blue Nile.' By Arthur J. Hayes, L.S.A., London Medical Officer, Quarantine Office, Suez. London: Smith, Elder & Co. 1905. *Price* 10*s.* 6*d.* net.

This book gives a pleasant and instructive account of a medical officer's experience on an expedition to the source of the Blue Nile and Lake Tsana, in connection with the great scheme for the Nile dam, the principal objects being a survey and the setting up of marks, whereby the rise of the Blue Nile could be annually

gauged. Starting from Khartum, Dr. Hayes and two companions, with the usual complement of natives and transport, proceeded by Gedaref and Gallabat to the shores of Lake Tsana (round which they travelled), returning to Berber by Gallabat and along the river Atbara.

The author describes, in a free and easy style, the social customs and religions of Abyssinia, besides sketching its geography in a very complete and up-to-date manner; while the somewhat prosaic details of travel are enlivened by some humorous descriptions of the interviews with the various chiefs of the districts passed through. As a guide to sportsmen the book would prove invaluable, and some very useful information is given to those interested in transport. Some idea of the lonely life led by the Government officials stationed at distant outposts may be gathered from an instance given by Dr. Hayes. At Gedaref the party ate their Christmas dinner with Mr. Fleming, who said, "You are the last white men I shall see until June next year."

In the preface the author looks on his book as likely to be useful in the event of a political crisis, but this subject is not treated very liberally. Throughout the book mention is made of the cotton-growing capabilities of the country, and a special reference is made to it in the preface. Two clearly drawn maps at the end of the book show the route taken by the expedition, though, being borrowed (with permission) from Sir W. Garstin's report, they do not correctly show the recently arranged frontier. The numerous illustrations give a good idea of the points of interest in the country, while a somewhat lengthy description of the religions and customs of Abyssinia is given at the close. Many humorous references are made to the various cases which came before Dr. Hayes for treatment, and there can be no doubt that diseases of the eyes and leprosy are the scourges of the Sudan. Dr. Poulton has added an appendix dealing with the entomology of Abyssinia, which should prove very useful to students of that most interesting science, and quotations are made from Mr. Mansfield Parkyns, Sir Samuel Baker, Dr. Stecker, and others.

It is to be regretted that the information regarding the actual work of the surveying party is so brief, as the lack of it lessens the permanent value of the book as a work of reference.

A. C. I.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

PEAT.

'Die Moore der Schweiz mit Berucksichtigung der gesamten Moorfrage.' Von Prof. Dr. J. Früh u. Prof. Dr Schröter Beitrage zur Geologie der Schweiz. Geotechnische Serie III., pp. xviii. + 750. *Map, 4 Plates, and Illustrations.*

The Swiss Geological Commission has accustomed us to the production of important memoirs, but probably none has equalled this volume of 768 closely printed quarto pages, in the exhaustiveness with which it treats its subject. Not even in America has a work appeared surpassing this production of the Zurich professors of geography and botany in the completeness with which a subject is treated, not only from the alpha to the omega of its own alphabet, but through a large part of the corresponding alphabets of allied subjects, and it is probable that, without the assistance of the Schnyder van Wartensee foundation, even the Geological Commission of Switzerland would have been unable to publish this work, with which the only fault to be found is that out of the elaboration of detail it is difficult to detach the general principles. This difficulty is lessened by the arrangement of the work in a series of chapters, each dealing with a special branch of the subject, and each written by the author most competent to deal with it.

The treatise opens with a short chapter, by Prof. Früh, devoted to the definition of what is meant by the word "Moore," which is defined in its widest sense as a surface which is growing upwards by the accumulation of vegetable matter, and in its special and most important sense as an area where this accumulation takes the form of peat. This is followed by an important chapter, by Prof. Schröter, on the peat-forming plants, and the distinction of the two classes of peat-bogs is clearly brought out. There are the Fasch- and Hoch-moore of the Germans, for which the English equivalents are given as flat and raised bog. We cannot recollect having met with the first of these terms, which is inappropriate, as the "flat" bog may have a steeply sloping surface, and we may suggest that swamp and upland are better equivalents of the German words, though there is no objection to the use of the term "raised bog" for the latter, as the term is in use, or, at any rate, has been used, and correctly describes one feature of the class.

The distinction is not a fanciful one, for the two classes of peat-bogs differ radically in their mode of origin. Swamp bogs are exclusively composed of water-loving plants, that is to say, plants which require an abundance of water carrying mineral matter, and especially lime, in solution. Upland bogs, on the other hand, are composed of plants which do not require, if they do not resent, a supply of mineral-bearing water. It is this last form which is most familiar to us, and most commonly associated with the notion of a peat-bog. It is confined to temperate regions with an abundant rainfall fairly distributed thoughout the year, and in almost, if not quite, every case owes its origin to those strange plants, the sphagna, or peat mosses, which possess no roots and draw no part of their nourishment from the ground they grow on, but are provided with an elaborate set of provisions for storing up the rainwater which falls upon them. They grow upwards in clumps consisting of an outer layer of living plant resting on the dead remains of previous years' growth, much as a coral reef grows outwards on the accumulated skeletons of the organisms by which it is formed. There is, indeed, much analogy between the growth of a peat moss and a coral reef, extending even to a similarity in the outward form of their surfaces; in both cases the growth is in the form of a number of knobs or knolls, with depressions winding in and out between, and just as a coral reef may be regarded as a hugely enlarged coral clump, so the upland bog may be regarded as an overgrown sphagnum clump.

This form of peat-bog is independent of the surface on which it grows; it may form on the crest of a watershed, or may succeed to a swamp bog in the bed of a valley, where this has grown upwards till its surface is raised above the influence of spring or river water, the two absolutely inimical circumstances being free drainage and the access of spring water containing mineral matter in solution. The plants associated with the peat moss are either of a kind that tolerates a water-logged subsoil, almost free from soluble minerals, or are such as draw little or no part of their subsistence from the soil they grow on; for the most part they have small roots or none at all, and some of them are as much at home in the driest and barrenest situations as on the surface of a water-logged peat-bog.

Having dealt with the plants which form the peat, the next subject taken up is the origin of this substance, which is regarded as the result of a special form of slow alteration of vegetable matter in the presence of water and the absence of free oxidation: it is neither a product of decay nor of fermentation; it does not seem to be produced by bacterial agency, and the resulting peat is not only a septic but antiseptic, and singularly resistant of decay. Peaty matter may be deposited under water by the accumulation of the remains of land and water plants; but this material, though it may have undergone a peaty change, and is treated by Prof. Früh as a form of peat, is hardly what is usually understood by that term,

the word being ordinarily applied to the product of the accumulation of plants growing on peat-bogs, whether of the swamp or upland sort.

Having disposed of the origin of peat, the work goes on through a series of chapters to treat of the various aspects from which it can be considered. It is impossible to deal with these in detail, and we can only mention three: the influence of peat-mosses on intercourse settlement and place-names, the industrial uses of peat-bogs, and the post-glacial history of the Swiss flora. These chapters are followed by detailed descriptions of the peat-bogs of Switzerland, by an extensive literature of the subject, and copious indices, the whole forming a work which must always remain useful to any one interested in the origin, distribution, or utilization of peat. R. D. O.

A GEOLOGICAL TEXT-BOOK.

'Structural and Field Geology for Students of Pure and Applied Science' By James Geikie, D.C.L., F.R.S., etc. Pp xx + 435; 56 plates and 142 illustrations in text Edinburgh: Oliver & Boyd; and London. Gurney & Jackson. 1905

This is a new handbook of geology which is specially addressed to beginners in field geology, but a hope is expressed, in the preface, that it may be found useful also to students who are preparing for professions in which some knowledge of structural geology is of practical importance. It is not the author's fault that the profession of mining is practically the only one to which this applies; to the civil engineer, as to the geographer, the work does not especially appeal, for the branches of geology which are of principal interest to them—those, namely, that deal with the agencies which shape the surface of the Earth—are relegated to a single brief chapter at the end of the book. This part of the science is, however, excluded by the title, and within the limits named by its author the book is pleasantly and clearly written, covers satisfactorily the subject it professes to deal with, and is adorned by a well-executed and judiciously selected series of illustrations which recall, by their absolute contrast, the crude and ill-executed wood blocks with which an earlier generation of students had generally to be content.

GENERAL.

A BRITISH PIONEER.

'Seymour Vandeleur' The Story of a British Officer By Colonel F I Maxse, C.B., D.S.O London: the National Review Office 1905.

Dedicated to the officers of the Brigade of Guards, this book will be found to contain a most interesting account of the life of the late Brevet Lieut.-Colonel Vandeleur, combined with a general description of his campaigns. The book commences with a brief history of Colonel Vandeleur's early life, which shows in various ways what a remarkable youth he was. Of his early manhood and study at the Royal Military College (Sandhurst) there is plenty of information, and a point worthy of notice is that Vandeleur learnt his elementary surveying and map-making (which eventually proved of immense value to him) at the Royal Geographical Society. Seymour Vandeleur made a special study of languages, and when he was under orders to proceed to any British colony or foreign district, he gathered all the information he could get from books on the country he was going to, and also learnt its language. On his return from Somaliland, he presented the Royal Geographical Society with a map of that country, which is still in their possession.

A portion of the subject-matter (*e.g.* the particulars of the Fashoda incident, the Sudan campaign, and the Boer war, as also the long account of the discovery

of the Victoria Nyanza) has little immediate connection with the main object of the book, though the chapter devoted to the Egyptian army at work is most interesting reading. Colonel Vandeleur's work in Nigeria and Uganda (which earned him his Distinguished Service Order) is, however, fully dealt with, and this is, of course, of most interest to geographers.

Colonel Maxse's book is full of excellent illustrations and maps, and forms a worthy record of Colonel Vandeleur's life, which must stand as a guide to officers and others who aim at extending the bounds of knowledge, at the same time reminding them of a man who lived a strenuous life and died in the service of his country.

A. C. I.

THE MONTHLY RECORD

EUROPE.

Geographical Researches in Andalusia.—If proof were needed of the important work still remaining to be done before the physical geography even of European countries is thoroughly understood, it would be supplied by an interesting paper on the basin of Guadix and Baza, contributed to the *Zeitschrift* of the Berlin Geographical Society by Dr. L. Siegert (1905, Nos. 7 and 8). There are districts in Spain which are little visited even by the tourist, and of which the physical features have yet been subjected to but little scientific investigation. Such is the district described by Dr. Siegert, which forms a remarkable basin almost surrounded by mountain ranges, in the eastern portion of Andalusia. The traveller reached the scene of his researches by the post road from Granada to Guadix, which leads across the rugged range of the Sierra Harana, and after following for a time the gorge-like valley of the Rio Fardes, suddenly emerges from the mountains and gives a bird's eye view over what appears to be a wide featureless plain, devoid of trees or human habitations. A closer view shows that its apparently level surface is really furrowed by valleys, whose sides are modelled by streams into the most wonderful architectural relief, and glow under the Andalusian sky with a perfect symphony of colour. The surface geology shows by contrast a general uniformity, the hard and soft strata of the Guadix formation being repeated with great monotony, while fossils are almost absent. On the surface of the plain, the botanical features are similarly uniform, the greater part being a steppe covered with esparto grass, though on approaching the mountains a greater variety is noticeable. The valleys, on the contrary, form in places regular gardens. Dr. Siegert enters very fully into the past geological events which are responsible for the existing form of the basin. This is found on examination to be composed, structurally, of two distinct parts, corresponding to the local division into the plains of Guadix and Baza, the latter lying east of the former. Topographically, the dividing-line is quite unnoticeable, but it may be drawn from the transverse valley of the Guadiana menor to the Sierra de Baza. The plain is watered by numberless streams, which take their rise in the surrounding mountains and escape by the Guadiana menor to the Guadalquivir and the Atlantic. The surrounding mountain-wall displays a complicated series of structure lines, which can only be understood after a careful study of the geological history of this part of Spain. The Palæozoic peneplain, which still remains undisturbed in the "Meseta" to the north, was in Andalusia depressed and covered with Mesozoic deposits, the dividing-line between the two areas being a great fault running from west-north-west to east-south-east. The southern block was again subjected to a tangential thrust

throughout the Tertiary period, and the Andalusian folded ranges resulted, exhibiting a complex series of folds and dislocations, in part due to the complex structure of the mass. The stratigraphical features, which Dr. Siegert discusses in detail, can only be briefly alluded to. The most recent deposits are the thick series of clays and shingle-beds known as the Guadix formation (which Dr. Siegert ascribes to the heavy precipitation of the diluvial period), and extensive sinter and tuff deposits. The extent to which these have been subjected to subsequent erosion has led some to suppose that a change of climate has taken place, and that the rivers formerly carried more water. Dr. Siegert, however, assigns as cause a change in the hydrography of the district. The transverse valley of the Guadiana menor, although corresponding with an ancient line of dislocation, is of recent date, being due to the cutting back of the river from the north, which has captured the drainage of the basin, and enabled the streams to excavate their beds to a lower level. The last part of the paper describes the morphological features of the present surface, which are well illustrated by photographs. One of the most striking features is the terrace formation on the valley sides, due to the alternation of hard and soft strata.

The Forest-line in the Eastern Alps.—The latest study on this subject is that of Prof. R. Marek, who has given a preliminary account of the results attained in the *Mitteilungen* of the Vienna Geographical Society, vol. 48, Nos. 8 and 9. Former attempts in this direction have either been concerned with the upward limits of growth of particular trees, not of continuous forest, or have embraced only a small portion of the whole surface, like those of Fritzsch and Reishauer, the latter of which was noticed in the *Journal* for July, 1904 (p. 93). Dr. Marek's work deals with the whole of the eastern Alps within the Austrian empire (*i.e.* four-fifths of the entire eastern section of the range), the reason for even this limitation being the desirability of using a uniform set of maps as a basis for the study. As to the method employed, a choice was open between personal observation throughout, and the employment of maps checked by observation. Dr. Marek shows that, given trustworthy maps, as the sheets of the special-map of the Austro-Hungarian monarchy on the scale of 1 : 75,000 proved to be, the degree of accuracy obtained by working from these is little inferior to that resulting from actual observation; and he therefore adopted these maps as a basis. He points out that the geographer's aim—to trace the climatic influences at work—is not attained by taking the mean actual limit of forest growth in various localities, since this is influenced by artificial agencies. He therefore determined the extreme upper limit of continuous wood for each locality, as this may be taken to represent better the natural limit. Working on these lines, he constructed a map showing in a generalized way the lines of equal altitude of forest growth ("isohyles") for the whole of the Austrian Alps. As in the case of other elements, the most important factor in determining the limit was found to be the general altitude (*Massenerhebung*) of the various parts of the range, both being highest together. Dividing the range from west to east into half-degree sections, Dr. Marek shows that the mean altitude of the forest-line falls almost regularly from the one end to the other, the total fall being from 6739 to 4915, or 1824 feet. The fall appears to become more rapid towards the east, and it must be a matter of future study to show whether this is the result of climatic factors. Local deviations from this rule of course occur, *e.g.* the line appears to fall in the neighbourhood of lakes, owing, Dr. Marek thinks, to the effect which these have in lowering the temperature during the growing months. The effect of wind in lowering the forest-line was noticeable especially at the mouths of valleys, and at their heads, in the neighbourhood of glaciers. Dr. Marek also determined the mean height of the forest-line for the separate divisions

of the Austrian Alps, according to Böhm's classification, and this enables him to determine the interval between that line and the snow-line as obtained by Richter, both for the eastern Alps as a whole and for separate groups. The figure obtained for the former is approximately 2460 feet.

Forestry in Belgium.—In the issue of *Nature* for December 21 last, Mr. W. R. Fisher gives some interesting notes on forestry in Belgium, based on the visit to that country of the Royal British Arboricultural Society in August, 1905. A striking picture is drawn of the progress lately made both in improving the management of the woodlands and in planting the waste lands of the country. In 1895 the area of forests was about 1,300,000 acres, or one-sixth of the total area of the country. This comparatively small proportion is the result of the unwise policy adopted between 1815 and 1830, when the Government sold all the state forests, the present area of these (62,600 acres) having been since bought back. Since 1897 waste land to the extent of 15,317 acres has also been acquired and planted by the state, while communes and private individuals have been encouraged by subsidies to do the like. Mr. Fisher especially mentions, as interesting to British municipalities, an immense tract of woods that cover the catchment area of the Gileppe, a stream rising in the Ardennes and feeding a large reservoir. Among the forests visited was the Forêt de Soignes, one of the most magnificent beech forests in Europe, containing trees 130 to 140 feet high and yielding a net annual revenue of £18,000 from timber alone. But perhaps one of the most interesting is the geographical arboretum at Tervueren, where the characteristic trees of the various regions of the old and new world are being planted in sections, broad-leaved trees and conifers being arranged in their natural mixture, while among them it is intended to plant the shrubs and herbaceous plants that naturally grow with the trees.

Invasion of the Sea on the Coasts of Cotentin.—The *Comptes Rendus* of the Congress of French Geographical Societies (Session XXIV., Rouen, 1904) contains an article enunciating and criticizing the view set forth in the eighteenth century by Abbot Le Franc, developed in the nineteenth, and held with reservations by Reclus, Desjardins, Girard, and Lenthéric—the view, namely, that from the sixth to the eighth centuries the west coast of Cotentin from Cape la Hogue to Carolles point had, owing to tidal inroad, retired 3 to 4 leagues, and in the Bay of St. Michel 7 to 8 leagues, so that Cancales point and the islands of Chausey, Jersey, and Alderney are remains of the ancient coast, and that a forest of Scissey, 7 to 8 leagues in extent, occupied the present site of St. Michel bay. But Jersey and the other islands, the article maintains, were islands in the time of the Romans. Nor is there any proof, material or documentary, that the coast from Cape la Hogue to Carolles has retreated. At lowest ebb there is no trace of constructions, forests, or routes. Le Franc and Quénault cite Italian maps of the sixteenth century showing Chausey and Casquets larger than to-day. Jolivet's map of Normandy (1545), on the other hand, shows the coast pretty much as it is now. Besides shapeless ruins, woods impossible to date, and an alleged Roman road from Avranches to Brittany, the theory of St. Michel's bay having once been forest rests on two texts. One is in the *Vie de St. Pair* (end of the sixth century). The Scissiacum there mentioned is, however, no forest as assumed, but St. Pair, where is still the port of embarkation for the islands. The other text is from the *Roman de St. Michel*, twelfth century, a rhymed chronicle for the use of pilgrims, in which, among wondrous legends, it is told how "where fish are swimming was once the forest Quakelunde between Avranches and St. Servan." But nowhere else is the name of this forest to be found, nor does any mediæval writer make any reference to the tide of 709 that destroyed it. Other facts invalidate the

testimony in the *Roman de St. Michel* as to the date of the destruction of the forest. The geographers and savants above cited have therefore shifted the sea's invasion to a more distant date than the beginning of the eighth century. In conclusion, the two characteristic features of the coast at this day are the formation of alluvium and of sandbanks—a phenomenon more fatal than any criticism to the validity of the view in question.

ASIA.

The Sea-route to Siberia.—At a meeting of the Paris Geographical Society last November, Mr. E. Blanc gave an account of the Russian naval expedition to the Yenesei, made with a view to once more testing the practicability of the sea-route as a means of commercial communication between Europe and Siberia (*La Geogr.*, December, 1905, p. 154). The undertaking was organized on a comprehensive scale, and is, in fact, the most serious attempt yet made to solve the problem in which the late Captain Wiggins took so keen an interest. Being in great measure dictated by necessities connected with the war in the Far East, the expedition was as far as possible kept from the knowledge of the public, though Mr. Blanc is mistaken in saying that it had altogether remained a secret until the date of the meeting referred to. Its projected departure had, *e.g.*, been recorded in the July number of *Petermanns Mitteilungen* (1905, p. 168). The immediate object of the expedition was the despatch of material for the widening of the Siberian railway, which could not be effected by land without interfering with the military necessities of the moment. It was also of great importance to test the possibilities of the sea-route as an auxiliary to the railway for the general purposes of the Manchurian campaign, while its future use as a commercial highway was also kept in view. For purposes of transport four cargo steamers of a considerable tonnage were chartered, while a flotilla of tugs and other small craft was also despatched for permanent use on the Siberian rivers. The ice-breaker *Yermak* and two cruisers also formed part of the expedition, as well as two German merchant vessels, which made the voyage on their own account in response to an invitation from the promoters. The command was entrusted to Colonel Sergieff, while assistance was given during the work of organization both by Captain Wiggins and by General Vilkitski, who had taken part in the latter's latest voyage to Northern Siberia in 1896. In spite of many difficulties and some disasters (including severe injuries to the *Yermak* during a gale encountered near Jugor strait), the undertaking has met with a considerable degree of success. The passage of Yugor strait was finally effected on September 3, and the Yenesei reached by the greater part of the squadron on September 13, while the German vessels made their way in safety to the Obi. Three of the cargo boats entered the mouth of the Yenesei, where their freights were transferred to the lighters intended for the river navigation. It was hoped that the river flotilla would reach Krasnoiarsk before winter set in. The possibilities of the route are also the subject of a paper in the *Annalen der Hydrographie* (1905, part xi.) by Dr. J. Herrmann of the German Hydrographical Office.

New Route to Petra.—Mr. P. L. Sclater writes: The recent extension of the Hejaz railway from Damascus to Maán has opened up a new route to Petra—an attractive spot to which access has hitherto been somewhat difficult and dangerous on account of the marauding Arabs. Mr. Douglas Carruthers (who has been collecting birds and mammals in the Syrian desert) sends me the following account of an excursion which he made to Petra from Damascus in company with two friends in April last: "The Kadam station of the Hedjaz railway is about an hour's drive from Damascus. The train goes every other day.

We left the Kadam station at 8.30 a.m. on April 24, in a train consisting of three carriages and the trucks which carried materials for the further construction of the line. We passed through the Hawran, great stretches of level and rolling plain, the granary of Syria, after which we entered on uncultivated land and desert—at this time of year green and flowery, and full of the herds and encampments of the Bedawin. About 2 p.m. we reached Dera, where the junction with the line from Haifa takes place. After an hour's halt here we proceeded to Ammán, which was reached about 8 p.m. We left Ammán about midnight, and travelled all night and next morning through a dreary country to Maán, at that time * the terminus of the railway, where we arrived about 1.30 p.m. Maán (about 3500 feet altitude) is in the open desert about halfway between the south end of the Dead sea and the north point of the Gulf of Akaba. Here we found encamped the soldiers and workmen who are engaged in the rough work of the line, and the Italian and Greek mechanics who are finishing it off. Next day (April 26) we hired donkeys to take us to Petra, about six hours' ride, and, after passing three days of admiration at the wonders of the place, returned to Damascus by the same route."

The Japanese Alps: Erratum.—In Mr. Weston's paper in the January number, the name of the peak ascended by him for the first time is Ho-o-zan (three syllables—"Phœnix Peak"), not Huzan, as printed on pp. 24, 25.

AFRICA.

The Blackened Rocks of the Nile Cataracts.—The cause of the black surface film found on many of the rocks of the Nile cataracts is once more discussed in a paper by Mr. A. Lucas, chief chemist at the Survey Department Laboratory in Cairo (Cairo: National Printing Department, 1905). As is well known, such rocks occur, not only on the Nile, but at the cataracts of many great rivers, including the Orinoco, Congo, and Niger. An investigation of the subject by MM. Lortet and Hougounenq, the results of which were published in the *Comptes Rendus* of the Paris Academy of Sciences in 1902, was referred to in the *Journal* for December of that year (vol. **20**, p. 655). Mr. Lucas has gone into the matter with unusual thoroughness, and has brought to light some new facts. He first discusses the question of the similar discoloration observed in the rocks of desert regions, and previously studied by Walther and others. A careful analysis of the film found on desert rocks was effected with the aid of strong hydrochloric acid, in which it is readily soluble, and this showed that, besides the oxides of iron and manganese, the film contained phosphoric acid and other ingredients not hitherto recognized. Doubt has been expressed by some observers whether all the rocks on which the film is found contain iron and manganese, but Mr. Lucas ascertained, on examining hundreds of different samples, that there was not a single instance of anything occurring in the film that was not also present in the rock below. All the constituents of the film, therefore, seem to be derived from the rock itself, the conditions necessary being a hot climate, coupled with occasional rainfall (or dew) by which the soluble compounds are dissolved, being afterwards brought to the surface by capillary attraction, and there forming insoluble oxides. In the case of the Nile rocks (granite, etc.) the film was again found to contain other ingredients than iron and manganese, but all these were likewise present in the rock itself, as also in the Nile water (both in suspension and solution). It is not easy to determine whether or not they are derived solely from the former

* The Hejaz railway has quite lately been carried on to Mudavéré, about 150 kilometres (94 miles) further.

source. All the conditions for the formation of the film from the rock in a manner analogous to that suggested for the desert film actually exist, as the rocks are almost always, if not universally, situated between the high and low water line. On the other hand, there seems to be evidence that the film may occur on permanently submerged rocks, while the fact that the rock is polished below the film, and certain indications of the occurrence of Nile mud also beneath it, would seem to favour the idea that it is a deposit from the water, as would also the similarity of composition of the film on the most diverse rocks. Lortet and Hougounenq considered the absence of the film from rocks below the cataract to indicate that it was not derived from the water, but Mr. Lucas shows that such absence is not quite certain, while the fact that the geological formations are naturally more resistant in the region of the cataracts would explain the prevalence of the blackened rocks in such localities. On the whole, however, he is inclined to consider the source of the film to be the rock itself, in the river no less than in the desert.

The Fayûm.—It is remarkable that as late as seven years ago this could be said to be an almost unexplored area both topographically and geologically. Since then the Egyptian Survey Department has gradually investigated it, and the results are now published ('The Topography and Geology of the Fayûm Province of Egypt,' by H. J. L. Beadnell. Cairo: 1905). Geologically, the most interesting discoveries have been those of bone beds yielding a number of new vertebrate genera, among them bones of cetacea of the genus *Zeuglodon*, of a remarkable hornèd ungulate (*Arsinoitherium*), a land tortoise (*Testudo Ammon*), and others, which will be described in a monograph to be issued by the trustees of the British Museum. The most valuable results from the geographical point of view are the proofs that the Fayûm, like the other oasis depressions of the Libyan desert, has been formed by sub-aërial denudation, and not by tectonic movements. Though the lowering of the rocks west of the Nile fault may have some share in determining the existing topography, the main characters of the Fayûm are due to the varying layers of rock. To the north the surface formation is Oligocene, and the Fayûm is cut out in a great series of sedimentary rocks of Middle and Upper Eocene and Oligocene age, remarkably constant over wide areas, with a northward dip at a very low angle varying from 1° to 5°, and averaging 2° to 3°. Any faultings are minor and local. The surface to the north is of Oligocene at a height of 340 metres, and sinks to the south along a steep scarp formed of Eocene to near or below the sea-level in three stages—the upper of fluvio-marine rocks of Oligocene or Upper Eocene, with a band of hard basalt intercalated at the very top; the middle and lower of Middle Eocene, with beds of very varied composition—limestones, marls, clays, sandstones, sands, and gravels. Owing to the different resistances, a series of dip-slope terraces is formed of bands of harder rock. Round the base is the alluvium bordering the lake Birket el Qurûn, 50 metres below sea-level, and covering the hard limestone which forms the bed of the depression. Thirty kilometres to the south-west is another depression in the limestone 80 metres above sea-level, in which a shallow pool is formed after rains, and is covered with silt when dry. Other similar basins exist on the plain to the south. In the extreme south-west the sides of the depression rise imperceptibly to the level of the plateau separating it from the Baharia depression at two days' distance. South of the Birket el Qurûn we have to consider (*a*) the western limestone area, with the Wadi Rayan depression; (*b*) the Bahr el Yusef; and (*c*) the ridge between this and the Nile. In the west the most important frontier is the Wadi Rayan, which Cope Whitehouse first suggested might be utilized as a reservoir, as the lowest point is 42 metres below sea-level, and 67·3 square kilometres lie below the

+27-metre contour. This is a metre above the lowest point of the ridge of limestone, clay, and sand, mainly between 34 and 60 metres above sea-level. This dividing ridge was probably always higher than the level of the ancient Lake Moeris. Sir Colin Scott Moncrieff, Sir William Garstin, Sir William Wilcocks,* and others have made reports at various times on this project, the last named suggesting the cutting of a canal through the desert opposite Mazana and entering the Wadi Rayan in the east. Any leakage which probably would not do any damage to cultivated lands of the Fayûm would be soon stopped by the alluvial deposits from the waters of the reservoir. On the eastern side of the Bahr Yusef, the ridge between the Fayûm and the Nile narrows from 10 kilometres in the north to 2½ kilometres opposite Gharaq, 30 kilometres south of the Birket el Qurûn. It is composed of Eocene beds of alternating calcareous sandstone and sandy limestone, overlain by thick deposits of conglomerate and gravel, reaching to 100 metres above the cultivated land. The slope is steep to the Fayûm, gradual to the Nile. The Bahr Yusef flows in a natural gap, and supplies the Fayûm with water, which spreads by many channels in all directions, most of which ultimately lead to the Birket el Qurûn, but some of which end in the Gharaq depression in the west. Cultivation is restricted to the area covered with river alluvium identical in composition and origin with the Nile mud. The greater supply of water due to new irrigation works up the Nile is permitting the extension of canals and cultivation. The Birket el Qurûn, or lake of horns, so called from the horn-like promontories which jut into the lake, is 40 kilometres by less than 10, and covers an area of 225 square kilometres. No depth over 5 metres has yet been recorded, but it is said to be deeper in the south-west. The north is bordered by desert; the cultivated area lies to the south. It is the remains of a prehistoric lake which formerly covered a larger part of the floor of the Fayûm depression, and in the times of the twelfth dynasty was converted into an artificially controlled sheet of water—Lake Moeris—which was used as a regulator, but since the time of the Persians or of the Ptolemies has ceased to act in this way, and its volume has steadily sunk. The relative freshness of the waters led Schweinfurth to conclude that there was some subterranean outlet, and currents in the waters support this, though these may have other causes.

Ruwenzori.—Mr. A. L. Mumm and Mr. Douglas Freshfield have returned to England from their visit to Ruwenzori. The icefall which stopped Sir H. Johnston and subsequent travellers was overcome without difficulty. But the persistent bad weather which veiled the upper snows in perpetual mists and rainstorms prevented the mountaineers from completing the ascent. From photographs, secured from a distance in temporary clearness, they believe that the upper portion of the mountain offers no serious difficulty to competent climbers with proper appliances, and that it is likely to be climbed before long by travellors approaching it at the proper seasons—which are well known to the tribes who hunt on it, and to a few missionaries—January and July. The orographical results of the expedition will be given in a future number.

French Hydrographical Surveys on the West Coast of Morocco.—We alluded in the January number (p. 90) to the surveys carried out last summer by Lieut. Dyé for the purpose of improving our knowledge of the hydrographical features of the west coast of Morocco. Reports on the work accomplished have been made by the commander of the expedition to the Comité du Maroc, by which body it was sent out, with the support of the French Admiralty and Foreign Office (*B. Com. Afr. Franç.*, 1905, No. 11, 1906, No. 1). It has been recognized

* 'The Assuan Reservoir and Lake Moeris.' London: 1904.

for some time that existing charts of this coast are inaccurate and incomplete, and Lieut. Dyé's mission (which, according to the plans laid down, will continue its work for three years) has commenced a series of systematic observations by which it is hoped to supply sailors with a trustworthy guide to the navigation of this part of the Atlantic seaboard. They include a careful triangulation of the coast-line, numerous soundings, and many astronomical, magnetic, and meteorological observations. The commercial statistics of Western Morocco and the capabilities of existing ports have also been studied, and Lieut. Dyé insists on the need of caution in accepting current statements in regard to the latter.

AMERICA.

The Fluctuations of Lake Ontario.—Mr. K. Tully, who for many years has made a special study of the fluctuations of level of Lake Ontario, places on record the results of a complete fifty years' series of observations in the *Transactions of the Canadian Institute* (vol. 8, part 1, September, 1905). The fluctuations of level, which some have thought to show a seven-year period, seem to be quite irregular, and do not even correspond with those of the rainfall. Between 1854 and 1878 the extreme variation of 63¼ inches occurred in the two years' interval between May 6, 1870 (highest), and March 19, 1872 (lowest). Between 1878 and 1893 the greatest variation was 59½ inches, between the high water of May 16, 1886, and the low water of March 7, 1892, but in 1895 a level 11½ feet lower still was reached on November 20, this being the lowest yet recorded. A comparison of the average fluctuations for different periods indicates that they have become less than formerly, and this is matched by a progressive diminution in the amount of rain and snowfall, which Mr. Tully ascribes to reckless destruction of forests in the region surrounding the lake. The harbour records show a fall of the water-level to the extent of 13·61 inches since 1854, but this cannot be explained by the diminution of rainfall, and seems rather due to engineering operations, such as the deepening of the outlet at the Galops rapids. In 1900 an extraordinary fluctuation of 1¼ inch in 15 minutes was detected by the automatic gauge, a strong north-west wind blowing at the time. The barometric records showed a rapid variation of pressure at about the same time.

Geological History of Trinidad.—A sketch of the geological processes which have brought about the existing physical features of the island of Trinidad is given by Mr. R. J. L. Guppy in the *Transactions of the Canadian Institute* for September last (vol. 8, part 1). Trinidad contains no volcanic rocks, but consists of deposits laid down in the sea as the result of the wear and tear of an extensive continent, lying probably to the north-east. The oldest of these deposits (shore deposits and limestones) were uplifted to form the Parian range, which runs east and west through the north of the island, but once formed the southern boundary of a continental land, the valleys of the Orinoco and Amazon being then covered by the ocean. The formations of the southern part of the island were deposited during the Cretaceous and Tertiary periods, and elevated towards the close of the latter, the island being at first continuous with the land now forming part of Venezuela, but being soon separated by extensive dislocations and depressions. The most important of these dislocations, which all run mainly east and west, appears to begin to the westward of the lagoon of Guarapiche, in Venezuela, passing through the Gulf of Paria and the Boca Grande, and extending thence to the north-eastward. Besides separating Trinidad from the mainland, it depressed the western side of the island, submerging the valleys in this part of the Parian range which had originated through aërial denudation, but which now form the various Bocas. The effect of

this and other dislocations is to be traced in the morphological features of the range, especially in the form of the valleys by which its southern slope is furrowed. While many of these are ditch-like and steep-sided in their lower portions, they form large lake-like expansions in their upper parts. The reason is that these upper portions were thrown down below the level of the lower parts, and became filled up by gravelly alluvium, the position of the fault, which crosses each valley in succession, being marked by the sudden narrowing of the valley. The upper valleys became vast underground reservoirs of water, which escapes slowly at their lower extremities, the perennial character of the streams in the northern part of the island being in large measure due to this phenomenon.

AUSTRALASIA AND PACIFIC ISLANDS.

Annexation of the Ashmore Islands.—The hoisting of the British flag at those islands, which lie between Timor and King sound, Western Australia, by H.M. cruiser *Cambrian*, was announced at the end of last year. The group is in itself of no practical importance, being described in the 'Australian Directory' as a reef "composed of coral and sand, on which are three low islets, and also several sandbanks which uncover at half ebb."

POLAR REGIONS.

Mr. Mikkelsen's Arctic Expedition.—Mr. Mikkelsen left this country in January for the United States, where he intends to complete the organization of his expedition to the Beaufort sea (*Journal*, vol. 26, p. 561). The leader will proceed to San Francisco, and proceed to the scene of his proposed work by way of Bering strait, while his colleagues, Mr. Leffingwell (geologist, member of the Baldwin-Ziegler expedition of 1901–2) and Mr. Ditlevsen (zoologist, member of the Amdrup expedition of 1900), with possibly a medical man, will take the route down the Mackenzie to the Arctic sea, where a scientific examination of the river-delta and neighbouring country will be made. Mr. Mikkelsen hopes to obtain from the United States Government the use of one of the small revenue vessels, of some 35 to 50 tons, not now in active service; otherwise he would have to trust to a whaler to take him to the Mackenzie region, and to the Dominion Government steamer at Cape Bathurst to transport his expedition to the south-west corner of Banks Land. The exclusive use of a vessel would enable him to undertake hydrographical research in the neighbourhood of Bering strait, but in any case he would complete his equipment (as regards dogs, kayaks, etc.) on the Siberian coast. The final arrangements will depend very much on whether a special vessel is available or not. If it should be, the year 1907 would probably be spent in investigations among the western islands of the Parry archipelago, the main journey of exploration, from a point on Prince Patrick Land, being postponed to the next spring. Otherwise it would take place in the spring of 1907.

Dr. Nansen on the North-West Passage.—At a meeting of the Norwegian Geographical Society in December last, Dr. Nansen spoke of the history of the north-west passage, *à propos* of Captain Amundsen's recent achievement, beginning from the early attempts to discover a sea-route to China to the north of America in the sixteenth century. As regards later attempts, he pointed out that, though the passage was effected by the McClure expedition, it was not accomplished by a ship, McClure having left the *Investigator* and made his way to the *Resolute* by a sledge journey, afterwards returning home in the *North Star*. Dr. Nansen considered that Amundsen's achievement was worthy to rank with the voyage of the *Vega* by the north-east, and passed a well-merited encomium on the care and foresight displayed by the navigator in the organization of his scheme. As regards

the present position of the *Gjöa*, he expressed his confidence in the efficiency of the measures taken by Amundsen for the safety of the ship, and in the prospect of the remaining portion of the voyage being safely completed next summer. Of a total of 750 nautical miles, 600 had already been accomplished, while the remaining 150 formed the less dangerous part of the passage.

The Argentine Stations in the Far South.—A despatch from H.M. Consul at Buenos Aires, with a copy of which we have been favoured by the Foreign Office, announces that Dr. Charcot's vessel, *Le Français*, has been acquired by the Argentine Government, and will be employed under its new name *El Austral* for keeping up communications with the meteorological and magnetic station founded by Mr. Bruce in the South Orkneys, and since taken over by the Argentine Government. It is also stated that a new station will be founded shortly at Booth or Wandel island (the site of Dr. Charcot's winter quarters), and that it is this station, not the older one, which will be in charge of Mr. Angus Rankin and his assistants (*Journal*, vol. **26**, p. 677).

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

The Indian Ocean Expedition.—A fourth report by Mr. J. Stanley Gardiner on the progress of this expedition was sent home by him on October 28 last, and was printed in *Nature* for December 21, 1905 (cf. *Journal*, vol. **26**, pp. 458, 561, 677). Coetivy island, which lies some 2° southward of the Seychelles, was higher than any before visited, rising on a flat coral reef into wind-blown sand ridges and hills up to 80 feet above sea-level. The land fauna and flora are almost the same, and scarcely richer than those of the Chagos, but the reefs showed a greater variety in every group of marine animals. On the east they were distinguished by their covering with a grass-like weed, locally termed "varech." From Coetivy the expedition proceeded to a point midway between Madagascar and Farquhar atoll, where the magnetic variation was found to be almost the same as at Mauritius, and the depth 1856 fathoms. Farquhar, like all the reefs subsequently visited, was remarkable for its almost completely covered "varech" reefs, both rim and lagoon. Its land attains a height of 70 feet, and is clearly of the same formation as that of Coetivy. It shows no trace of elevation, and has not been formed, as has been stated, by marine deposits. The outer slope was quite similar to that of other atolls. Soundings along the line from Farquhar to the Amirantes and Seychelles gave depths varying from 890 to 2170 fathoms, and as the depth on either side is only about 2300, any connecting ridge along this line is of doubtful importance. Near Providence—a great reef 28 miles long by 7 broad to the 100-fathom line—a dredging at 744 fathoms brought up 5 cwt. of stones, the largest about 2 feet in diameter. It was largely formed of crystals, being almost devoid of organic deposits. Some masses looked like solidified ash or clay, while others appeared rather like volcanic bombs. All were more or less coated with manganese. The result of expert examination will be of much interest in connection with the question of former land-connections in this region. The Amirantes, as well as Alphonse and François to the south, are merely sandbanks resting on reefs, no parts of any being more than 10 feet above high-tide level, and the hills represented on some of the islands in the charts have no real existence. Apart from Desroches, which is separated by a channel 874 fathoms deep, all lie on a bank about 50 miles long by 20 wide, with an average depth of about 30 fathoms. Nearly all the reefs lie at the edge of the bank, but the edge is in most places covered by 8 to 10 fathoms of water. Its slope is unusually steep. With two exceptions, all the islands of the group are now planted for coconut oil, but the indigenous vegetation still remains in places. The land plants and animals are almost the same as at Coetivy and the

Chagos, there being few additions due to the proximity of Africa and the Seychelles. The marine fauna and flora were, however, markedly richer even than at Coetivy. The excellent scientific work done by the expedition has now been brought to a close, and Mr. Gardiner bears witness to the valuable assistance rendered throughout by Commander Somerville, his officers and men.

GENERAL.

Richthofen's Successor.—Hofrat Dr. Albrecht Penck, Prof. of Physical Geography at the university of Vienna, has been appointed to succeed to the geographical chair of the late Baron von Richthofen. Born September 25, 1858, at Reudnitz, near Leipzig, Albrecht Penck studied at the Realschule and University of Leipzig. He took part in the geological survey of Saxony; took his doctor's degree before 1878; qualified as teacher in 1883 at the university of Munich; and in 1886 married Jela Ganghofer, a sister of the well-known author. Called in 1885 to succeed Friedrich Simony at the university of Vienna, he developed a far-reaching activity as scientific investigator and teacher. A disciple of the great American geologists, he combined their method of research with the geographical contemplation of nature, becoming, and with increasing participation, founder, along with Richthofen, of modern "Physiogeography." The principal works published by him during his uncommonly productive career as author are 'Die Vergletscherung der deutschen Alpen,' 1882 (a prize essay), "Das Deutsche Reich" and "Die Niederlande in Belgien" (appearing in Kirchhoff's *Länderkunde von Europa*, 1885–1889); 'Die Donau,' 1891; 'Morphologie der Erdoberfläche,' 1894; 'Die Alpen im Eiszeitalter' (written in co-operation with Ed. Brückner), 1901 and following years. As important works of smaller compass may be named 'Mensch und Eiszeit,' 1884; 'Die Eiszeit in den Pyrenieen,' 1884; 'Ziele der Erdkunde in Oesterreich,' 1889; 'Studien über das Klima Spaniens im Tertiär und Diluvium,' 1894—not to cite numberless other publications. Reference may, however, be here made to his discussions on the project of a uniform map of the Earth on the scale of 1 : 1,000,000, put forward by him in 1891. Prof. Penck is first and foremost an "intensive" student of the geographical conditions of Central Europe; yet he has traversed the northern and western lands of Europe, if with hasty, yet also with penetrating eye. Prof. Penck has also edited the *Geographische Abhandlungen* and other serial publications.

The World's Corn Production.—An interesting summary of the statistics of grain production in 1905 throughout the world is given in *Export* for November 9 last, on the basis of the annual report of the Hungarian Ministry of Agriculture. The figures are to some extent provisional, but may be relied on to give a correct general view of the facts. The statistics given bear on the five principal grain crops—viz. wheat, rye, barley, oats, and maize. The total crop was somewhat less than in 1904, but the deficit was almost entirely confined to Europe, so that an increased export from extra-European countries, especially North America and Argentina, is to be anticipated. An interesting table gives the figures for the countries of the world, divided into importing and exporting countries, and this brings out clearly the striking change which has lately taken place in regard to the main sources of wheat-supply to the importing countries. In 1904, the year for which exports and imports are given, the exports from the United States showed a continuance of the decline which had been noticeable during the two previous years, and to such an extent that that country at present takes quite a subordinate rank among the exporting countries. It has, of course, been long recognized that with the increase of population the proportion of the total crop available for export would gradually diminish; but few can have anticipated the

rapidity of the process, which, unless some special influence has been temporarily at work, appears quite phenomenal. Thus, although the production has continued to increase, the amount exported in 1904 fell to about a quarter of the amount exported in 1901. Of the exporting countries, Russia was easily first, with a total nearly three times that of the United States; * Argentina next, with nearly half as much again as the latter; and British India third, with a quarter as much again, the recent increase in the case of the two last having been exceedingly rapid. Canada, on the other hand, came far behind, with a total little more than half that of the United States. These facts bear striking witness to the ease with which the world's markets adjust themselves to the necessities of the moment, and also to the expansion of which the wheat production is still capable. Of European countries, France is still able to produce the greater part of the grain needed for home consumption, though the German imports show a steady increase. Hungary increases her production, though the exports (almost entirely to Austria) remain stationary. The fourth place for wheat production is taken by Italy.

The Ninth International Geographical Congress.—It will be remembered that, at the Washington meeting in 1904, the Congress accepted the invitation extended by the Swiss Government and the Geneva Geographical Society to meet in 1908 in Geneva. Steps are already being taken in Switzerland to set on foot the necessary preparations, and a circular has been issued by the Geneva Geographical Society, announcing that the meeting will be held between July 27 and August 6, 1908. An organizing committee will shortly be formed, and it is hoped that a provisional programme may be issued in the course of the year.

The Queensland Geographical Society.—An intimation has been received that the Queensland branch of the Royal Geographical Society of Australia proposes to celebrate the twenty-first anniversary of its formation in June next. Arrangements are being made for the delivery of a series of special addresses by eminent authorities on geographical science in its widest sense.

The "Geographen Kalendar."—A new issue of this useful annual will shortly be published, and we are asked by the editor to urge on all those to whom proofs have been sent for correction the importance of their prompt return.

Acquisition for the Map Collection.—An interesting acquisition has lately been made in the form of a copy, in excellent preservation, of the old Dutch hydrographical atlas brought out in 1584-85 by Lucas Jansz. Waghenaer under the title 'Spiegel der Zeevaerdt.' This work was virtually the first printed collection of nautical charts ever issued, and is one of the rarer monuments of sixteenth-century cartography, perfect copies being not frequently met with. The charts represent, in considerable detail, the European coasts most frequented by the Dutch sailors of the period, and embrace the whole of western Europe from northern Norway to the Straits of Gibraltar. The work consists of two volumes (bound in one, as usually, in the present copy), the first of which appeared in 1584, the second in 1585, in which year a second edition of the former was also brought out. There is a copy of the work in the British Museum, but in this case both the first and second volumes bear the latter date. It is remarkable that even where the subject-matter is identical, the type of the text was, as in so many of the early atlases, entirely re-set for the second edition, while variations occur even in the issues of vol. 2 during the same year.

* The Russian wheat harvest was, however, in 1905 only 60 per cent. of that in 1904.

OBITUARY.

Captain W. D. McSwiney.

We regret to announce the death of Captain William Daniel McSwiney, late 7th Dragoon Guards, after a long illness, at the early age of forty-four. He was the youngest son of the late Rev. I. H. H. McSwiney, Rector of Barnoldby-le-Beck, Lincolnshire.

The deceased officer resigned a captain's commission in the Staffordshire Militia in November, 1886, in order to enlist in the 19th Hussars, from which he obtained a commission in the 7th Dragoon Guards two years later. He was very fond of travel and adventure, and was therefore glad to be employed on reconnaissance work in Persia in 1890–91. On his return he made an excellent report on the trade routes of that country, and received the thanks of the Commander-in-Chief in India for his work. In 1899 he was again engaged in exploration work in China, where he made a special reconnaissance of the Han river, and on his return he received the thanks of the Secretary of State for War.

Next year, at the outbreak of the Boxer troubles in China, the late Captain W. D. McSwiney was selected for employment as a special service officer with the expeditionary force. His knowledge of foreign languages, his tact, skill, and sound common sense, enabled him to smooth over many difficulties, especially during the Anglo-Russian Railway dispute at Tientsin, where Captain McSwiney was appointed railway staff officer. General Sir E. G. Barrow, Chief of the Staff of the Anglo-Indian contingent, has borne generous testimony to his tact and reliability under circumstances of great difficulty and delicacy. The late Lord Hardwick, when making his statement in the House of Lords on March 28, 1901, on the Anglo-Russian Railway dispute of Tientsin, said, "I shall only be praising those to whom praise is due if I commend, in the warmest manner, the tact and self-control displayed by the British officers on the spot."

With reference to his exploration work in China, Captain McSwiney considered that the waterways of that country were the real trade routes, and that we should make more use of them. "China," he says, "is essentially a country of waterways. Its surface is literally intersected in all directions by rivers, lakes, and canals, and a very large proportion of the traffic is carried on by water. Only those who have been on the Chinese rivers and canals can form any idea of the teeming population who work out a livelihood in boats. Water-traffic appeals to the Chinaman, and the boating population—a sturdy well-fed race—is always the most friendly. Their junks can be made very comfortable, and almost remind one of the houseboats on the Thames, and cheery Henley days. A great deal has been heard of railway concessions, but little endeavour seems to have been made to improve and work the already existing waterways, which are the acknowledged cheapest means of transport in China, as in other countries."

On the conclusion of the Boxer troubles in China, the late Captain McSwiney proceeded to join his regiment in South Africa, and took part in the operations in the Transvaal and Orange River Colony, obtaining the Queen's medal and five clasps. He was there struck down by enteric fever for the second time in his life, and invalided to England. He retired from the service only last year on account of continued heart trouble, to which he finally succumbed, deeply regretted by all who knew him. He was elected a Fellow of the Royal Geographical Society in 1898. Captain McSwiney leaves a widow and one child.

CORRESPONDENCE.

Need for Continuity in the Conduct of Antarctic Discovery.

PROJECTED EXPEDITION OF LIEUT. MICHAEL BARNE, R.N.

January, 1906.

WHEN the Society resolved to take up the great work of Antarctic discovery, it was certainly with the intention of promoting the continuity of our researches until that work was completed. The first effort was wisely decided to be made with a view to solving the geographical problems suggested by the voyage of Sir James Ross. The complete success of the recent Antarctic Expedition, under the command of Captain Scott, with this object, while largely extending our actual knowledge, has also opened out several new problems in geography and geology of which we are bound to seek the solution. These are the discovery of the unknown portion of the great mountain range, the extent and character of King Edward VII. Land, the southern extent of the great ice barrier, and the distribution of land and water on the other side of the pole; to be ascertained by way of the Weddell sea. The latitude reached by Weddell in that sea has not yet been passed.

For the next effort there is a clearly defined and definite object, leading directly to further increases to our knowledge. This is the discovery of the insular or continental character of Graham Land. When this is certainly known there will be a great advance towards the solution of the chief problems brought out by the discoveries of Captain Scott's Antarctic Expedition. An enterprise with this definite object would only entail one-eighth of the cost of the expedition of 1901–04. It will have an object of great geographical importance, with a fair prospect of success. There are alternative routes by the open sea in Weddell's track, or along the east coast of Graham Land.

Lieut. Michael Barne, a distinguished member of the late expedition, is striving to organize an attempt to achieve this great geographical object. There is no available person who has equal qualifications. With inexhaustible energy and pluck, he is ballasted with prudence and experience. He is a good sailor and navigator, a trained magnetic observer, and he had charge of the deep-sea sounding-gear in the last expedition. Barne has had the experience of two polar winters, he conducted two extended sledge journeys, and he won the love and confidence of all who served under him. Captain Scott has the highest opinions of his young lieutenant's qualifications for leading a difficult enterprise.

With such a commander we may feel confident in the result, and that his expedition will advance the work of Antarctic discovery by a long step. It will be necessary to raise funds, and there will be other difficulties; but they must be overcome, for it is a comparatively small sum that is needed. There will certainly be cordial sympathy on the part of our Council.

CLEMENTS R. MARKHAM.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905-1906.

Fourth Meeting, December 18, 1905.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS:—*Colonel Henry Appleton, R.E.; Lieut. Chetwode George Green Crawley (R.M. Artillery); Robert Holmes Edleston, F.S.A.; Captain W. H. Maud*

(*Somerset Light Infantry*); *Henry Rivers Nevill*; *David Randall-MacIver, M.A.*; *Wilfred G. Walker.*

The paper read was:—

"Anthropogeographical Investigations in British New Guinea" (with cinematograph illustrations). By Dr. C. G. Seligmann and Dr. W. Mersh Strong.

RESEARCH DEPARTMENT.

December 13, 1905.—Major L. DARWIN in the Chair.

1. "Criticism of the Ordnance Survey Maps from the Point of View of the Antiquities on them." By F. J. Haverfield.

2. "The Vertical Distribution of Land in England and Wales." By Nora E. MacMunn (introduced by Dr. A. J. Herbertson).

3. Exhibition of some Statistical Maps prepared by Students at the Oxford School of Geography. By Dr. A. J. Herbertson.

Fifth Meeting, *January* 15, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS.—*Thomas Reginald Baldwin, B.A.*; *Richard Cooke, A.C.P.*; *Lieut. C. H. Gabriel, I.A.*; *F. J. Hughes*; *Harry Kemble*; *Alexander Macdonald*; *Hugh Giffin McKinney*; *Edward John Munby*; *John William Potter*; *Robert Siveweight*; *George Sowman*; *Henry Newton Stevens*; *William Baker Whelan.*

The paper read was:—

"British East African Plateau and its Economic Conditions." By Major A. St. Hill Gibbons.

SIR MOUNTSTUART GRANT DUFF.

The PRESIDENT said: I could not, speaking from this chair, open our proceedings to-night without making a passing reference, which must be all too brief, to the lamented death of our former President, Sir Mountstuart Grant Duff. The Fellows of the Society know that he was a Fellow for some forty-five years, and that he served as President for four years, from 1889 to 1893. I need not tell you that Sir Mountstuart Grant Duff was a man of the greatest distinction; distinction of intellect, distinction of character, and distinction in service to his country. He brought to the Presidential Chair an admirably equipped mind and a vast store of experience. He was by nature an historian and a geographer. The two qualities in their higher forms can, indeed, hardly be separated from each other. I can speak from personal experience of the admirable way in which he performed his duties as President during those four years, for I had the honour at that time to be a Member of the Council. He devoted himself to the Presidential work with the greatest possible assiduity and ability, and it has been with deep regret that the Fellows of the Society, and especially those who, like myself, had personal ties of friendship, have learnt of his death.

MR. EINAR MIKKELSEN'S ARCTIC EXPEDITION.

The PRESIDENT said: Before we separate, I must carry you for one moment from the equator to the arctic circle. I presume that you have read in the current number of our *Journal* a paper by Sir Clements Markham—it was his recent address to the Research Department—on what remained to be done in the arctic

circle in the way of exploration. He pointed out that the next great work was the exploration of the Beaufort sea between the archipelago north of America and the New Siberian islands. Mr. Einar Mikkelsen—who is here to-night, and that is why I introduce the subject—is now starting to explore this arctic region. Our Society has given a donation to the expedition—not, indeed, a large one, but enough to show that it wishes Mr. Mikkelsen full success. On your behalf I now wish him God-speed.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Is. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *G.Z.* 11 (1905): 523-526 **Frech.**
Noch einmal die Einheitlichkeit der Eiszeit und die "Eiszeiten" in den Alpen. Von Prof. Dr. F. Frech.

Alps. *M.K.K.G. Ges. Wien* 48 (1905): 403-425. **Marek.**
Waldgrenzstudien in den österreichischen Alpen. Vorläufiger Bericht über deren bisherige Ergebnisse. Von Prof. Dr R. Marek.
Noticed in the Monthly Record (*ante*, p. 191).

Alps—Lakes. *G.Z.* 11 (1905): 381-388. **Penck.**
Die grossen Alpenseen. Von A. Penck.

Austria **Müllner.**
Die Seen des unteren Inntales in der Umgebung von Rattenberg und Kufstein. Von Dr. J. Müllner. (Sonderabdruck aus der Ferdinandeums-Zeitschrift 3 F. 49 Heft.) Innsbruck, 1905. Size 8½ × 5½, pp. 126. *Maps. Presented by the Author.*

Austria—Bohemia. *G.Z.* 11 (1905): 344-346. **Zemmrich.**
Die Sprachgebiete Böhmens nach der Volkszählung von 1900. Von Dr. J. Zemmrich.

Baltic. *Geol. Mag.* **2** (1905): 311–320, 337–352, 407–413, 454–462. **Howorth.**
The Recent Geological History of the Baltic. By Sir H. H. Howorth. *With Map and Illustration.*

Baltic Coasts. *Math. u. Naturw. Berichte Ungarn* **20** (1902): 332–336. **Bernátsky.**
Ueber die Vegetation des Flugsandes an der Ostsee. Von Dr. J. Bernátsky.

Europe. **Mingard.**
Round the World Geographical Handbooks. III. Europe. By W. Vere Mingard. London: T. C. & E. C. Jack, [*not dated*]. Size 7 × 5, pp. 108. *Maps and Illustrations. Price* 6*d. Presented by the Publishers.*

Europe—Trade Routes. *Contemporary Rev.* **88** (1905): 665–677. **Mann.**
New Trade Routes in Europe. By J. S. Mann. *With Maps.*

A forecast of the effect of the opening of the Simplon tunnel and other railways in course of construction.

France. *Ann. G.* **14** (1905): 296–309. **Angot.**
La température de la France. Par A. Angot. *With Maps.*

France. **Potter.**
Some Summer Resorts in the South of France. By J. W. Potter, 1905. Nice: Galignani Library. Size 7 × 5, pp. 114. *Presented by the Author.*

France—Agriculture. *Contemporary Rev.* **88** (1905): 729–751. **Eltzbacher.**
The agricultural prosperity of France. By O. Eltzbacher.

France—Mauges. *Ann. G.* **14** (1905): 310–317. **Levainville.**
Les Mauges. Notes de géographie humaine. Par le Capitaine Levainville.

A district in Maine-et-Loire to the south of the river Loire.

Germany. *Deutsch. Rundschau G.* **27** (1905): 464–466. **Mankowski.**
Zur Regulierung der Nogat. Von H. Mankowski. *With Map.*

Germany—Bavaria. *Deutsch. Rundschau G.* **28** (1905). 21–30. **Reindl.**
Der Einfluss der Eisenbahnen auf die Verteilung der Menschen und ihrer Siedelungen in Bayern. Von Dr. J. Reindl.

Russia *Deutsche G. Blätter* **28** (1905) 73–96. **Friederichsen.**
Russland, Land und Leute Von Dr Max Friederichsen

Russia *Mem. Hydrography* **26** (1904) 156–159 **Filipoff.**
Port Morzhowetz on the Kanin peninsula By A. M. Filipoff. [In Russian.]

Russia *National G. Mag.* **16** (1905): 309–332. **Grosvenor.**
Evolution of Russian Government. By Dr E. A. Grosvenor. *With Illustrations.*

Scandinavia—Earth-movements. **Högbom.**
Nya Bidrag till Kännedomen om de Kvartära Nivåförandringarna. I. Norra Skandinavien. Af A. G. Högbom. (Meddelanden från Upsala Universitets Mineralogisch-Geologiska Institution, 26.) Stockholm, 1904. Size 8½ × 5½, pp. 26. *Map and Section.*

Spain—Volcanoes. **Sapper.**
Die Catalonischen Vulkane. Von Karl Sapper. (Sonder-Abdruck aus der Zeitschrift der Deutschen geologischen Gesellschaft, Band 56, Heft 3.) Size 9 × 5½, pp. (9). *Map and Diagram. Presented by the Author.*

Sweden and Norway. **Nordlund.**
The Swedish-Norwegian Crisis: A History with Documents. By Dr K. Nordlund Upsala and Stockholm (1905). Size 9 × 6, pp. 108. *Presented by Messrs. Romeike and Curtice.*

Sweden and Norway. ———
The Union between Sweden and Norway. The Address presented to the King by the Swedish Parliament. Stockholm, 1905. Size 8½ × 5½, pp. 16.

Switzerland. ———
Graphische Darstellung der Schweizerischen hydrometrischen Beobachtungen und der Luft-Temperaturen und Niederschlags-Höhen für das Jahr 1903. [In German and French.] Bern, 1904. Size 15 × 9½, pp. 20. *Diagrams.*

Switzerland—Census.
Statistique de la Suisse, 145[e] Livraison. Résultats Statistiques du Recensement Fédéral du 1[er] Décembre, 1900. 2[e] vol. La population répartie d'après le sexe,

l'état civil et l'âge. Berne, 1905. Size 11 × 9, pp. 32 and 406 *Maps and Diagrams.*

Turkey. *Sitzb. K A W. Wien* **113** *Abt.* 1 (1904): 104–118. **Schaffer.**

Die geologischen Ergebnisse einer Reise in Thrakien im Herbste 1902. Von Dr. F. X. Schaffer. *With Map.*

Turkey—Samothrace. *B.S R. Belge G.* **29** (1905): 168–181, 281–301. **Hauttecœur.**

L'Ile de Samothrace (Samothraki). Par H. Hauttecœur. *With Map*

United Kingdom—Archæology. ———

Report of the Committee on Ancient Earthworks and Fortified Enclosures, presented to the Congress of Archæological Societies, 5th July, 1905 Size 8½ × 5½, pp. 6. *Presented by I. C. Gould, Esq*

United Kingdom—Cambridgeshire. **Fordham.**

Cambridge Maps. An annotated List of the pre-Survey Maps of the County of Cambridge, 1579–1800 By H. G. Fordham (From the *Cambridge Antiquarian Society's Communications*, vol 11) [*Not dated*] Size 11½ × 9, pp (72). *Facsimiles Presented by the Author.*

A very complete list of printed maps of Cambridgeshire from the time of Christopher Saxton onwards, with notes.

United Kingdom—Cornwall. *G. Teacher* **3** (1905): 13–22. **Andrews.**

The Northern Cliffs of the Land's End Peninsula. By A. W. Andrews. *Map and Illustrations.*

United Kingdom—Isle of Wight. **Reid.**

The Island of Ictis. Communicated to the Society of Antiquaries by Clement Reid, F.R.S London: Printed by J B. Nichols & Sons, 1905 Size 12 × 10, pp. 8. *Maps. Presented by the Author.*

Noticed in the Monthly Record.

United Kingdom—Oxfordshire, etc **Evans.**

Highways and Byways in Oxford and the Cotswolds. By H A Evans, with Illustrations by F. L Griggs. London: Macmillan & Co, 1905 Size 8 × 5½, pp. xvi. and 408. *Maps and Illustrations. Price* 6s *Presented by the Publishers.*

Describes a summer excursion into the hill-country north and west of Oxford, with a preliminary tour through that city. As in the other volumes of the series, the archæology, history, and associations of the district are frequently touched upon.

United Kingdom—Scotland. **Shearer.**

Old Maps and Map Makers of Scotland, by J. E Shearer, Bookseller. Stirling: R. S. Shearer & Son, 1905. Size 10½ × 7½, pp. vi. and 86 *Facsimile Maps. Price* 10s. *Presented by the Publishers.*

Re-issue in extended form of papers in the *Scottish Geographical Magazine*, the first of which was noticed in the *Journal* for September last (p. 327). It is useful as bringing together, by means of reproductions, the most important of the early maps of Scotland.

United Kingdom—Scotland. **Lewis**

The Plant-remains in the Scottish Peat Mosses. By Francis J Lewis Part I. The Scottish Southern Uplands. (From the *Transactions of the Royal Society of Edinburgh*, vol. **41**, 1905) Size 12 × 9½, pp [25] *Plates. Presented by the Author.*

See Monthly Record, *ante.*

United Kingdom—Wales. **Bradley.**

In the March and Borderland of Wales By A G. Bradley With sketches of the country by W. M. Meredith. London: A Constable & Co., 1905 Size 9½ × 6½, pp. xvi. and 430. *Map and Illustrations. Price* 10s. 6d *net. Presented by the Publishers.*

Describes, in the pleasant style to which readers of Mr. Bradley's books have become accustomed, a most interesting portion of Great Britain, with abundant notes on the historical associations. The illustrations are particularly attractive.

United Kingdom—Yorkshire. **Home.**

The Evolution of an English Town. Being the story of the ancient town of Pickering, in Yorkshire, from Prehistoric times up to the year of our Lord Nineteen Hundred and Five. By Gordon Home. London: J M. Dent & Co., 1905. Size 9 × 6½, pp. xx. and 292. *Map and Illustrations. Price* 10s 6d. *net*

The opening chapters deal with the early physical history of the vale of Pickering

as influenced by the glacial epoch, etc. The fortunes of the town in Roman, Saxon, and later times are then traced in succession.

ASIA.

Asia—Ostiaks. **Zichy.**
Dritte Asiatische Forschungsreise des Grafen Eugen Zichy. Band V. Sammlung Ostjakischer Volksdichtungen, Heldengesänge mythologischen Inhalts, Götterbeschwörungsformeln und Bärenlieder auf Grund des Regulyschen Nachlasses und eigener Sammlungen. Von J. Pápay. Leipzig: K. W. Hiersemann, 1905. Size 12½ × 9½, pp. lxxxii. and 282. *Portrait and Facsimiles. Price* 20*s.*

Central Asia—Tian Shan. *Tour du Monde* **11** (1905): 457-516. **Brocherel.**
Voyage du Prince Scipion Borghèse aux Monts Célestes. Par J. Brocherel. *With Maps and Illustrations.*

China. *M. Seminars Orient. Sprachen* **8**, 1 Abt. (1905): 269-292. **Betz.**
Von Ichang über Land nach Chungking. Von Dr. Betz. *With Map and Illustrations.*

Dr Betz took the route, rarely if ever followed by Europeans, on the north side of the Yang-tse.

China. **[Campbell.]**
Military Report on the Provinces of Shensi and Kansu (Shen-Kan). Compiled in the Intelligence Branch, Quarter-Master-General's Department, Simla. Simla, 1905. Size 10 × 6, pp. 298. *Plans and Illustrations. Presented by the Intelligence Branch, Quarter-Master-General's Dep., Simla.*

China. *M. Seminars Orient. Sprachen* **8**, 1 Abt. (1905): 139-181. **Tschepe.**
Die drei Kiang des Chouking. Ihre Geschichte von ehedem bis jetzt. Von P. A. Tschepe. *With Maps.*

Discusses the problem of the three Kiangs (great rivers) mentioned in the historical work "Chouking."

China—Sechuan. *J. China Br. R. Asiatic S.* **36** (1905): 36-50. **Vale.**
Irrigation of the Chen-tu Plain and beyond. By J. Vale. *With Plan.*

China—Sechuan. *J. China Br. R. Asiatic S.* **36** (1905): 51-102. **Watson.**
Journey to Sungp'an. By W. C. H. Watson *With Map*

China—Weihaiwei. ———
Weihaiwei. Report for 1904. Colonial Reports, Annual No. 450, 1905. Size 9½ × 6½, pp 56. *Price* 2½*d.*

Chinese Empire—Tibet. **Landon.**
Perceval Landon. A Lhassa, la ville interdite. Description du Tibet Central et des coutumes de ses habitants relation de la marche de la mission envoyée par le Gouvernement Anglais (1903-1904). Paris: Hachette et Cie, 1906 [1905]. Size 10 × 7, pp. viii. and 450. *Map and Illustrations. Price* 20 *fr. Presented by the Publishers.*

A well-got-up translation of Mr. Landon's work, slightly abridged. It contains all the photogravures, but none of the text illustrations.

Philippine Islands. **Atkinson.**
The Philippine Islands. By F. W. Atkinson. Boston, etc.: Ginn & Co., 1905. Size 8½ × 6, pp iv. and 426. *Maps and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.* [To be reviewed.]

Philippine Islands. *National G. Mag.* **16** (1905): 361-375. **Taft.**
The Philippines. By the Hon. W. H. Taft. *With Illustrations.*

Russia—Armenia. *Iz. Imp. Russ. G.S.* **40** (1904): 355-398. **Grinevsky.**
Preliminary report on the journey in Armenia and Karabagh. *With Illustrations.* [In Russian.]

Russia—Caucasus. *J.R. United Service I.* **49** (1905): 1164-1174. **Beresford.**
The Stronghold of Schamyl By Colonel C. E. de la Poer Beresford.

Russia—Caucasus. *Iz. Imp. Russ. G.S.* **40** (1904): 273-293. **Shershenko.**
The Kurtatinsk pass and the Zeiski glacier. By A. I. Shershenko. [In Russian.]

Russia—Siberia. **Bogoras.**
The Chuckchee. By W. Bogoras. I.—Material Culture. (Publ. Jesup North Pacific Expedition, vol. 7, part I.) Leiden and New York, 1904. Size 14 × 11, pp. 276. *Map and Illustrations.*

Russia—Siberia. *Mem. Hydrography* **26** (1904): 160–167. **Filipoff.**
Waterway to Siberia by Yahmal peninsula. By A. Filipoff. [In Russian]

Russia—Siberia. **Laufer.**
The Decorative Art of the Amur Tribes. By B. Laufer. (Publ. Jesup North Pacific Expedition, vol. 4, part i. = *Mem. Amer. Museum Nat Hist.*, vol. 7, part. i.) New York, 1902. Size 14 × 11, pp. 86. *Illustrations.*

Russia—Siberia—Lake Baikal. *Iz Imp. Russ G.S.* **40** (1904): 294–329. **Drishenko.**
Observations of the Hydrographical Expedition on Lake Baikal. By F. Drishenko. [In Russian.]

Turkestan. *Iz. Turkestan Br. Imp. Russ. G.S.* **4** (1905). pp. 262. **Berg**
Scientific Results of the Aral Expedition of the Turkestan Branch of the Imperial Geographical Society. Part vi. L Berg Die Fische von Turkestan. [In Russian.] *With illustrations.*

Turkey. *Abhandl. K.K.G Ges. Wien.* **6** (1905): No. 1. **Penther**
Eine Reise in das Gebiet des Erdschias Dagh (Kleinasien), 1902. Von D Arnold Penther. Mit Beiträgen von Dr E. Zederbauer und L. Tschamler. Pp 48. *Map and Plates.*

Noticed in the Monthly Record (December, p. 667).

Turkey—Mecca Railway *Petermanns M.* **51** (1905): 189–191. **Saad.**
Die Mekkabahn und die Stadt Haifa am Karmelgebirge. Von Dr Saad.

Turkey—Palestine. *Globus* **88** (1905). 117–120. **Klengel.**
Ueber das Klima von Palastina Von Dr. F. Klengel

AFRICA.

Africa—Communications. **Roget and Pourbaix.**
B.S. d'Études Colon. **12** (1905): 385–412.
La Pénétration du Centre Africain Banana port maritime et tête de ligne de chemin de fer. Par L. Roget et V. Pourbaix. *With Maps*

Deals with the general question of African communications, as well as with the special subject mentioned in the title.

British East Africa. —
British East Africa Protectorate. Report on the Working of the Uganda Railway and the Steamboat Service on Lake Victoria, 1904 05 London Wyman & Sons, 1905. Size 13½ × 8½, pp 40 *Price 4d.*

British East Africa—Language **McGregor.**
A Grammar of the Kikuyu Language (British East Africa) By A. W. McGregor London, 1905. Size 7 × 4½, pp. 160. *Presented by the Author.*

The first Kikuyu grammar ever published

Cape Colony. *Mountain Club Annual, Cape Town* **9** (1904 5): 17–20. [**Ford.**]
Groot Drakenstein Peak By S. Y F. *Illustration*

Cape Colony. **Gill.**
Report of His Majesty's Astronomer at the Cape of Good Hope to the Secretary of the Admiralty, for the year 1904. London Printed by Eyre & Spottiswoode, 1905 Size 12½ × 10, pp 18.

Central Africa—Okapi. *Ymer* **25** (1905) 313–323. **Lönnberg.**
Okapidjurets geografiska utbredning jämte några notiser om Kongolandets fauna. Af E. Lönnberg. *With Map and Illustration.*

Central Africa—Ruwenzori. *Mouvement G.* **22** (1905): 523–527. **Wauters.**
Le massif neigeux du Ruwenzori. Par A. J. Wauters. *With Map and Illustration.*

Congo. *Mouvement G.* **22** (1905): 346–349. **Stainier.**
La géologie du Congo. Par X. Stainier.

Egypt. **Gollock.**

River, Sand, and Sun. Being sketches of the C.M.S Egypt Mission. By Minna C. Gollock. London: Church Missionary House, 1906 [1905]. Size 8½ × 6½, pp. vi. and 184. *Illustrations. Price 3s. 6d. Presented by the Church Missionary Society.*

French Guinea. **Machat.**

Guinée Française. Les Rivières du Sud et le Fouta-Diallon. Géographie physique et Civilisations indigènes Par J. Machat. Paris: A. Challamel, 1906 (1905). Size 11½ × 8, pp. 326. *Maps. Presented by the Author.*

The most careful and detailed study of this region that has yet appeared.

Morocco. **Meakin.**

Life in Morocco and Glimpses beyond. By Budgett Meakin. London: Chatto & Windus, 1905. Size 9 × 6, pp. xii. and 400. *Illustrations. Price 12s. 6d. net. Presented by the Publishers.*

Popular sketches derived from the author's personal experiences in Morocco, with a *résumé* of recent events and discussion of the political outlook.

North-East Africa. **Hayes.**

The Source of the Blue Nile. A record of a journey through the Soudan to Lake Tsana in Western Abyssinia, and of the return to Egypt by the valley of the Atbara, with a Note on the Religion, Customs, etc., of Abyssinia. By A. J. Hayes, and an Entomological Appendix by E. B. Poulton, LL.D. London: Smith, Elder & Co., 1905. Size 9 × 6, pp. xii. and 316. *Maps and Illustrations. Price 10s. 6d. net. Presented by the Publishers.*

The increased attention now directed to Abyssinia lends some interest to this book, as not much has been written of late on the western part of the country, although the journey, of course, broke no new ground The book embodies information collected from other works. (See Reviews, *ante*.)

Sahara. **Duveyrier, Maunoir, and Schirmer.**

Sahara Algérien et Tunisien. Journal de Route de Henri Duveyrier, publié et annoté par C. Maunoir et H. Schirmer. Précédé d'une Biographie de H. Duveyrier par C. Maunoir. Paris: A Challamel, 1905. Size 10 × 6½, pp. xxiv. and 214. *Presented by Mme. C. Maunoir.*

A selection from the unpublished notes of the well-known Saharan explorer, dealing with the journey of 1860.

Sahara. **Foureau.**

Documents scientifiques de la Mission Saharienne. Mission Foureau-Lamy "d'Alger au Congo par le Tchad." Par F. Foureau. (Publ. de la Soc. de Géogr. Paris.) Fasc. ii., iii. Paris: Masson et Cie., 1903–1905. Size 13 × 10, pp. 1210. *Maps and Illustrations; and Maps in separate cover. Two copies, presented by M. F. Foureau, and the Société de Géographie, Paris.* [To be reviewed.]

Sahara. **Besset and Flamand.**

Renseignements Colon., Comité Afrique Française (1905): 123–139.

Esquisse géologique des regions de l'Ahnet, du Tanesrouft, de l'Adrar (Nord), du Tassili des Ahaggar, du Ahaggar et du Tifedest. Capitaine Besset. *With Diagrams.*

Note sur les observations géologiques et morphologiques relevées par le capitaine Besset, suivie d'un appendice lithologique, G. B. M. Flamand.

Sahara. *La G., B.S.G. Paris* **12** (1905): 130–135. ——

Le Sahel maure et le Hodh. *With Map.*

Sahara. *Rev. G.* **55** (1905): 193–197. ——

Une reconnaissance dans l'Erg Iguidi. *With Map and Illustrations.*

The reconnaissance was made by Captain Flye-Sainte-Marie from Tuat, in order to obtain information on the routes leading from Morocco to the Sudan (see December number, p. 671).

Somaliland. **Jennings and Addison.**

With the Abyssinians in Somaliland. By Major J. W. Jennings and C. Addison, with a Preface by Colonel A. N. Rochfort, C.B., etc. London: Hodder & Stoughton, 1905. Size 9½ × 6½, pp. xii. and 266. *Map and Illustrations. Price 10s. 6d. net. Presented by the Publishers.*

Narrative of the expedition undertaken during the operations against the "Mad

Mullah." It supplies an interesting insight into the military organization of the Abyssinians and their methods of conducting an expedition.

South Africa—Boundary. ———

Africa, No. 5 (1905). Award of His Majesty the King of Italy respecting the Western Boundary of the Barotse Kingdom. London: Wyman & Sons, 1905. Size 13½ × 8½, pp 6. *Map. Price* 2½*d.*

See article in the August number, with map.

South Africa—Bushmen. *M. Deutsch. Schutzgeb.* **18** (1905): 194–292. **Passarge.**

Die Buschmänner der Kalahari. Von Dr. S. Passarge. *With Map and Illustrations.*

South Africa—Kalahari. *M. deuts Schutzgeb.* **18** (1905): 194–292. **Passarge.**

Die Buschmänner der Kalahari. Von Dr. S. Passarge. *Map and Illustrations.*

A detailed study of the Bushmen, their distribution, mode of life, etc.

Sudan—River-system. *Rev. Colon.*, N.S. No. 26 (1905): 257–264. **Meynier.**

Le régime hydrographique du Soudan. Par le Captaine O. Meynier.

The writer thinks that the rivers of the Western Sudan all show a tendency to shift their courses southward, and that various districts are becoming more and more dry.

Togo. *Globus* **88** (1905): 137–139. **Kürchhoff.**

Das künstliche Wegenetz in Togo. Von D. Kürchhoff. *With Map.*

Besides the railway to Agome, there is a network of footpaths, and a limited number of roads with bridges.

Togo. *M. aus den Deuts. Schutzgebieten* **18** (1905): 161. **Sprigade.**

Begleitworte zu Karte Nr. 2, "Die Umgebung der Station Atakpame." Von P. Sprigade. *With Map.*

Togo—Boundary. *M. aus den Deuts. Schutzgebieten.* **18** (1905): 95–154 **Ambronn.**

Ueber die Tätigheit der deutschen Abteilung der deutsch-englischen Grenzregulierungs-Expedition in Togo und die weiteren astronomischgeodätischen Arbeiten des Oberleutnants Freiherrn v. Seefried an der Ostgrenze dieses Schutzgebietes während der Jahre 1901 bis 1903. . . . Von Prof. Dr. L. Ambron. *Diagrams and Illustrations.*

Tripoli. *B.S.G. Italiana* **6** (1905): 653–677. **Jaja.**

Sul valore economico della Tripolitania. Appunti del dott. G. Jaja.

NORTH AMERICA.

Canada—Census. ———

Fourth Census of Canada, 1901. Vol. 3. Manufactures. Ottawa, 1905. Size 10 × 7, pp. lxxviii., lxxxiv, and 384. *Presented by the Census Office, Ottawa.*

Canada—Meteorology. *P.R.S.*, Ser. A., **76** (1905): 415–418. **McLeod.**

Records of Difference of Temperature between McGill College Observatory and the Top of Mount Royal, Montreal. By Prof. C. McLeod. *With Diagrams.*

Mexico. *Mem. S. Ci. "Antonio Alzate"* **17** (1902): 125–131. **Laguerenne.**

Estado de Tabasco. Por T. L. Laguerenne.

North America. *Deutsch. G. Blätter* **28** (1905): 155–248. **Oppel.**

Reise in den Prairien und Seengebieten von Nordamerika. Von Prof. Dr. A. Oppel.

North America—Lake Superior. **Oppel.**

Globus **88** (1905): 229–233, 245–248, 277–281, 297–304.

Der Obere See in Nordamerika. Teilweise auf Grund eigener Reisen von Prof. Dr. A. Oppel. *With Illustrations.*

United States—Geology. **Ries.**

Economic Geology of the United States. By H. Ries, PH.D. New York: the Macmillan Company; London: Macmillan & Co., 1905. Size 8½ × 6, pp. xx. and 436. *Maps and Illustrations. Price* $2.60. *Presented by the Publishers.*

A useful Handbook on the mineral resources of the United States.

CENTRAL AND SOUTH AMERICA.

Brazil—Rio Grande do Sul. **Jannasch.**
Export **27** (1905): 465, 481, 495, 511, 527, 543, 578, 593, 610, 625, 639.
Land und Leute von Rio Grande do Sul. Vortrag von Dr. D. Jannasch. *With Map and Illustrations.*

Central America. *M.K.K.G. Ges. Wien* **48** (1905): 434–481. **Fischer.**
Beobachtungen und Daten von meiner Studienreise nach Panama und Costa Rica. Von E. S. Fischer. *With Illustration*

Central America. *J. Anthrop I.* **35** (1905): 103–112 **Gann.**
The Ancient Monuments of Northern Honduras and the adjacent parts of Yucatan and Guatemala, the Former Civilization in these parts, and the chief characteristics of the Races now inhabiting them; with an account of a visit to the Rio Grande Ruins. By Dr. T. W. Gann.

Central America and Mexico. **Seler and others.**
B. Bureau American Ethnology **28** (1904): pp. 682.
Mexican and Central American Antiquities, Calendar Systems, and History. Twenty-four papers by E. Soler, E Förstemann, P. Schellhas, C. Sapper, and E. P. Dieseldorff. Translated from the German under the supervision of C P. Bowditch. *With Illustrations.*

Chile. *An. hidrog. Marina Chile* **24** (1903): 3–32. **Nef.**
Levantamiento del seno Baker i canales interiores por la cañonera *Magallanes*, al mando del capitan de fragata señor Francisco Nef, en 1900 i 1901. *With Chart.*

AUSTRALASIA AND PACIFIC ISLANDS

Australia—Alps. *G.Z.* **11** (1905): 497–503. **Lendenfeld.**
Die australische Alpenlandschaft. Von R. von Lendenfeld. *With Illustrations.*

New Guinea—German. *Globus* **88** (1905): 325–331, 349–353. **Stephan.**
Ein modernes Kolonialabenteuer. (Die Gründung von Port Breton durch Marquis de Rays.) Von E. Stephan. *With Map.*

History of a fraudulent scheme for colonization in New Ireland started in 1877–79.

Pacific Islands, etc. **Schneider.**
Muschelgeld-Studien. Von Prof. Dr. O. Schneider. Nach dem hinterlassenen Manuskript bearbeitet von C. Ribbe. Herausgegeben vom Verein für Erdkunde zu Dresden Dresden: E. Engelmann, 1905. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 190. *Illustrations. Presented by the Verein für Erdkunde, Dresden.*

Samoa. *Petermanns M.* **51** (1905): 255–256. **Reinecke and Linke.**
Der neue vulkanische Ausbruch auf Savaii. Von Dr. F. Reinecke.
Eine Umgehung des neuen Kraters am 9. und 10. September. 1905. Von Dr. F. Linke.

Cf. note in the December number (vol. **26**, p. 675)

Solomon Islands. **Woodford.**
British Solomon Islands. Report for 1903–4 and 1904–5. Colonial Reports, Annual No. 461, 1905. Size $10 \times 6\frac{1}{2}$, pp. 34. *Price* $2\frac{1}{2}d$.

POLAR REGIONS.

Antarctic. **Richthofen.**
Ergebnisse und Ziele der Südpolarforschung. Von F. Freiherr von Richthofen. Berlin: D. Reimer (E. Vohsen), 1905. Size 11×8, pp. 28. *Map. Price* 1 *m. Presented by the Publisher.*

See *Journal*, January number, p. 15.

Antarctic. *Petermanns M.* **51** (1905): 241–247. **Schott.**
Die Bodenformen und Bodentemperaturen des südlichen Eismeeres. Nach dem Stande der Kenntnisse bis 1905 bearbeitet von Dr. G. Schott. *With Map.*

Antarctic—Swedish Expedition. **Diaz.**
Teatro Nacional. El Alférey Sobral. Drama en Verso y en un Acto, dividido

en Cuatro Cuadros. Original de Antonio Americo Diaz. Buenos Aires, 1904. Size 7 × 5, pp. 32. *Presented by Dr. Robert Lehmann-Nitsche.*

The story of Nordenskjöld's expedition and its rescue by the Argentine gunboat *Uruguay* in dramatic form.

MATHEMATICAL GEOGRAPHY.

Cartography—Projection. *Petermanns M.* **51** (1905): 259–261 **Rothamel.**

Ist die Bezeichnung "Cassini-Soldnersche Zylinderprojektion" berechtigt? Von Major Rothamel.

Geodesy. **Tinter.**

Veröffentlichung der k. k. österreichischen Kommission der internationalen Erdmessung. Die Schlussfehler der Dreiecke der Triangulierung erster Ordnung in der k. u. k. österreichisch-ungarischen Monarchie und ihre Beziehung zu dem Gesetze von *Gauss* über die Wahrscheinlichkeit der Fehler, etc. Von Dr. W. Tinter. Wien, 1904-5. Size 9½ × 6, pp. 42.

Longitudes. ——

Note on the Determination of the Longitude Paris—Greenwich in the year 1902. (From the *Monthly Notices of the Royal Astronomical Society*, January, 1905.) Size 8½ × 5½, pp. (5).

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geological History. *Ymer* **25** (1905): 150–155 **Simmons.**

Har en landbrygga öfver Nordatlanten funnits i postglacial tid? Af H. G. Simmons.

On the question of a post-glacial land-connection between the two sides of the North Atlantic.

Geomorphology. *J. Geology* **13** (1905): 381–407. **Davis.**

The Geographical Cycle in an Arid Climate. By W. M. Davis.

See article by the same author in the January number.

Glacial Epoch. *Geolog. Mag.* **2** (1905): 484–490. **Jamieson.**

Some Changes of Level in the Glacial Period. By T. F. Jamieson.

Glaciers. *Petermanns M.* **51** (1905): 256–258. **Finsterwalder and Brückner.**

Protokoll der III. Internationalen Gletscherkonferenz in Maloja vom 6 bis 9. September 1905. Von Prof. Dr. S. Finsterwalder und Prof. Dr. E. Brückner.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Kirchhoff.**

Zur Verständigung über die Begriffe Nation und Nationalität. Von A. Kirchhoff. Halle a. S., 1905. Size 9½ × 6½, pp. 64. *Presented by the Author.*

Commercial—Corn. *Export* **27** (1905): 690–693. ——

Die Getreideproduktion der Welt im Jahre 1905.

A noteworthy fact is the comparatively low place (the fourth) taken by the United States among the principal wheat exporting countries.

Commercial Geography. **Eckert.**

Leitfaden der Handelsgeographie. Von Dr. M. Eckert. Leipzig: G. J. Goschen, 1905. Size 8½ × 6, pp. 248. *Price 3m. Presented by the Publisher.*

The author's larger work was reviewed in the *Journal* for July last (vol. **26**, p. 80). The present work, which has been extracted and adapted from the former, is intended as a school book.

Historical—Early Travels. **Purchas.**

Hakluytus Posthumus or Purchas His Pilgrimes. By S. Purchas, B.D. Vols. **9** and **10**. Glasgow: J. MacLehose & Sons, 1905. Size 9 × 6, pp. (vol. **9**) xx. and 570; (vol. **10**) xvi. and 526. *Maps. Price 12s. 6d net. per vol Presented by the Publishers.*

These volumes deal mainly with voyages to the East.

Historical—Vespucci. **Sarnow and Trübenbach.**

Mundus Novus. Ein Bericht Amerigo Vespucci's an Lorenzo de Medici über seine Reise nach Brasilien in den Jahren 1501–02. Nach einem exemplare der zu Rostock von Hermann Barckhusen gedruckten Folioausgabe, im Besitze der Stadtbibliothek zu Frankfurt a. M., in Faksimile und mit Einleitungen herausgegeben von Dr. E. Sarnow und Dr. K. Trübenbach Strassburg im Elsass: J. H. E. Heitz (Heitz & Mündel), 1903. Size 14 × 10, pp 24. *Price* 9*s*.

Facsimile reproduction of the excessively rare folio edition, from the copy in the city library at Frankfurt-on-Main. *With Introduction.*

Historical—Welsers. **Haebler.**

Die überseeischen Unternehmungen der Welser und ihrer Gesellschafter. Von K. Haebler. Leipzig: C. L. Hirschfeld, 1903. Size 9½ × 6½, pp. viii. and 398. *Price* 8*s*. 6*d*.

A history of the commercial undertakings of the great German bankers in the sixteenth century, not only in South America, but in other newly opened regions of the world. Geographically, the principal interest centres in the journeys into the interior of South America carried out by Federmann and other agents of the Welsers.

BIOGRAPHY.

Berger. *G.Z.* 11 (1905): 489–497. **Kretschmer.**

Hugo Berger. Von K. Kretschmer.

Berger was the author of a standard work on ancient Greek geography.

Campos. *B.R.S.G. Madrid* 47 (1905): 177–203. ——

Reunión extraordinaria y Sesión pública celebrada el 31 de Enero de 1905 en honra y memoria del Sr. D. Rafael Torres Campos, Secretario general que fué de la Sociedad. *With Portrait.*

Ruge. *M.V.E. Leipzig*, 1904 (1905): 79–94 **Gravelius.**

Sophus Ruge. Von H. Gravelius. *With Portrait.*

Smith. **Bradley.**

Captain John Smith. By A. G. Bradley. London: Macmillan & Co., 1905. Size 8 × 5½, pp. viii. and 226. *Portrait and Map. Price* 2*s*. 6*d*. *Presented by the Publishers.*

An excellent account of the life and achievements of the well-known Virginian pioneer, forming one of the "Men of Action Series."

Stübel *M.V.E. Leipzig*, 1904 (1905): 59–78. **Meyer.**

Alphons Stübel. Von H. Meyer. *With Portraits.*

This distinguished explorer of Ecuador died on November 10, 1904.

Vandeleur. **Maxse.**

Seymour Vandeleur: the Story of a British Officer, being a Memoir of Brevet-Lieut.-Colonel Vandeleur, D.S.O., Scots Guards and Irish Guards, with a general description of his campaigns. By Colonel F. I. Maxse, C.B., D.S.O. London: The National Review Office, 1905. Size 10 × 7¼, pp. 288. *Maps, Plans, and Illustrations. Presented by the Author.* [See review, *ante*.]

GENERAL.

Africa and Australasia. *Deutsch. Rundschau G.* 27 (1905): 548–562. **Umlauft.**

Fortschritte der geographischen Forschungen und Reisen im Jahre 1904. 3. Afrika; 4. Australien und die Südsee. Von Dr. F. Umlauft.

Belgium—Commerce. ——

Etablissements Belges à l'Etranger. (Annexe au B. S. d'Études Colon., Juin 1905.) Bruxelles. Size 10 × 6½, pp. 92.

Bibliography.

Catalogue of Early-printed and other interesting Books, Manuscripts, and Fine Bindings, offered for sale by J. & J. Leighton, 40, Brewer Street, Golden Square, London, W. [9 Parts.] Size 8¼ × 5¼, pp. 1738. *Facsimile Illustrations. Price* (*each part*) 2*s*. *Presented by Messrs. J. & J. Leighton.*

Includes a fair proportion of geographical items, among them some valuable fifteenth and sixteenth century rarities.

Congress. *B.S.G. Italiana* 6 (1905): 921-930 **Porro.**

Il X. Congresso internazionale di navigazione tenuto a Milano dal 24 settembre al 1° ottobro. Nota del colonnello C. Porro.

Educational. **Chaix.**

Notes d'analyse géographique, conditions qui déterminent la valeur économique d'un pays. Par E. Chaix. Genève. P. Dürr, 1906 [1905]. Size 7½ × 5, pp vi. and 48. *Diagrams. Presented by the Author.*

Educational. **Simmons and Richardson**

An Introduction to Practical Geography By A T Simmons and H Richardson. London: Macmillan & Co., 1905. Size 7 × 5, pp xii and 380. *Illustrations. Price* 3s. 6d. *Presented by the Publishers.*

An excellent guide to practical work in geography for schools.

World. **Moncrieff.**

The World of To-day By A. R Hope Moncrieff. Vol 4. London: the Gresham Publishing Co, 1905 Size 11 × 7½, pp. vi and 266. *Maps and Illustrations Price* 8s. *net. Presented by the Publishers.*

This volume is devoted to Madagascar and its neighbours, Australasia and the Pacific Islands, the whole under the title Oceania. Like the former volumes, it is excellently illustrated, and the descriptions are, on the whole, good.

Year Book. **Baden-Powell.**

The Science Year Book . and Diary for 1906 Edited by Major B. F. S. Baden-Powell London · King, Sell, & Olding Size 9½ × 6, pp. 208 and 365. *Portrait. Price* 5s. *net. Presented by the Publishers.*

A useful work of reference, including notes and tables on various scientific subjects, articles on the progress of science during 1905, and a directory of public institutions and scientific men.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary **Artaria and Freud.**

Artaria's Eisenbahn- und Postkarte von Oesterreich-Ungarn Nach offiziellen Quellen zusammengestellt von Alexander Freud. Vierte Neubearbeitung VI Auflage Scale 1 : 1,500,000 or 1 inch to 23·7 stat. miles. Vienna: Artaria & Co., 1906 *Price* 2 20*k*. *Presented by the Publisher.*

Bavaria. **Topographisch Bureau, Munich.**

Hypsometrische Karte von Bayern Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets · 1 3, 5-14 Munich: Topographisch Bureau des K. B. Generalstabes. [1905.]

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from December 1 to 31, 1905.

10 miles to 1 inch: –

Great Britain, printed in colours, folded in cover (7 and 8). *Price, on paper*, 1s.; *mounted on linen*, 1s. 6*d*. *each.*

2 miles to 1 inch:—

Printed in colours, folded in cover or flat in sheets, 21. *Price, on paper*, 1s.; *mounted on linen*, 1s 6*d*. *each.*

1 inch—(third edition):—

In outline, 30, 32, 37, 38, 41, 47, 58, 106, (117 and 133), 118, 134, 150, 216, 223, 241, 250, 258, 259, 290, 305, 306, 342. 1s. *each.*

With hills in brown or black, 20, 30, 37, 38, 47, 94, (117 and 133), 118, 120, 134, 136, 149, 342. 1s. *each.*

Printed in colours, folded in cover or flat in sheets, 251, 271, 272, 304, 320. *Price, on paper*, 1s.; *mounted on linen*, 1s. 6*d*. *each.*

6-inch—County Maps (first revision):—

Brecknockshire, 3 S.W., S.E., 6 N.W., S.W, 9 N W., S E., 14 N.E., S.W., S.E., 20 N.W., 43 N.W. **Cardiganshire**, 22 S.W., S.E., 28 N.W., S.W., 36 N.W., S.E. **Carmarthenshire**, 3 S E., 11 S.W., 19 N W., 50 N.W. **Devonshire**, 9 S.E., 10 N.E., 11 S.E., (12*a* S.E. and 12 S.W.), 14 S.E., 15 N.E., 16 S.W., 20 S.E., 21 N.W., S W., S.E., 22 N.W., N.E., 23 N.W, S.W., 24 N E, S E., 28 N.E., 29 N.W, 30 N.W., N.E., 31 N.W, 32 N.W, 34 S W., 35 N.W., 44 N.E., 45 N.W., 47 S.E. **Herefordshire**, 22 N W. **Lincolnshire**, 96 N.E, S.E., 104 N.W., S.W., 105 S.E., 106 S.W., S.E, 113 S.E., 122 S.E, 123 N.W., 128 S W., 132 N.W. **Norfolk**, 92 S.W., 103 S.W., 104 S.W., 111 N.W. **Somerset**, 67 S.W. **Suffolk**, 6 S.W., 12 N W, 14 S.W., 15 S.W., 17 N E., 26 N.W **Warwickshire**, 30 S.E., 33 N.E., S.W., 41 N.E., 54 N.E., S.E. **Worcestershire**, 23 S.E. **Yorkshire** (first revision of 1891 survey), 288 N.W. 1*s. each.*

25-inch—County Maps (first revision):—

Cardiganshire, XXIX. 12; XXX. 6, 7, 8, 9, 10, 11, 14, 15, 16; XXXI. (5 and 1), 9, 13, XXXVIII. 2, 3, 4, 10, 11, 12; XXXIX. 1; XL. 16; XLI. 13, 14; XLVI. 4; XLVII. 1. **Carmarthenshire**, VII. 13, 14, 15; IX 14; X. 18; XIV. 4, 8, 12; XV. 1, 2, 3, 5, 6, 7, 9, 10, 11; XVIII. 5, 6, 7, 9, 10, 11. **Devonshire**, XVII. 14; XXVII. 2; XLII. 10, 16; LIII 2, 4, 7, 8, 11, 12, 14, 15, 16; LXV. 3, 4, 8, 10, 12, 14, 15, 16, LXXVI. 6, 7, 8. 11, 12; LXXVII. 3, 4, 5, 6, 7, 8, 9, 11, 12, 15, 16; LXXVIII. 1, 5, 9, 13; LXXX. 1, 3, 5, 6, 7, 9, 10, 14, 15; LXXXVIII. 10, 14; LXXXIX. 4; XCVIII. 10; CVI 2, 3, 6, 7, 8, 10, 11, 12, 14, 15; CVII. 9; CIX. 14; CX. 14; CXII. 2, 4, 6, 8, 10; CXIV. 7, 15; CXV. 8, 15, 16; CXIX. 12, 14, 15, 16; CXXI. 1, 2, 6, 7, 10, 12 **Lincolnshire**, LXIX. 15; LXXVII 1.; LXXVIII. 4, 15; LXXX. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; LXXXI. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; LXXXII. 1, 2, 5, 6, 7, 9, 10, 13, 14, 15; CI. 8, 9, 10, 11, 14, 15. **Norfolk**, I. 13, 16; V. 8, 12, 16; VI 1, 3, 7, 8, 10, 13, 15, 16; VII. 2, 6, 7, 9, 10, 13, 15, XV. 5, 9, 10, 12, 13, 14, 15, 16; XVI. 5, 6, 9, 11, 13, 15; XXI. 11, 12, 15, 16; XXIV. 1, 2, 3, 5, 6, 8, 16; XXV. 1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15; XXXII. 4, 8, 11, 12, 14, 15, 16; XXXV. 4, 8, 12, 16; XXXVI. 1, 3, 5, 7, 9, 10, 11, 14; XLVII. 4, 8, 12, 16; LIX. 8, 12, 16; LXXI 4, 8, 12, 16; LXXII. 5, 6, 7, 9, 10, 11, 13, 14, 15; LXXXIII. 16; LXXXIV. 1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15; XCIV. 3. **Warwickshire**, LII 11; LVII. 11. **Yorkshire** (First Revision of 1891 Survey), CCLXXII. 7, 8, 9, 10, 12, 13, 14, 15, 16; CCLXXX. 4; CCLXXXI. 1, 2, 3, 4, 8; CCLXXXII 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16; CCXCIV. 4, 8, 12, 13, 15; CCXCVIII. 1, 2, 3, 6; CCXCIX. 1. 3*s. each.*

England and Wales. **Geological Survey.**

Maps—**1 inch**—New Series (colour printed):—

267, Hungerford, Newbury, 332, Bognor; 334, Newhaven, Eastbourne. Drift edition. 1*s.* 6*d. each.*

(*E. Stanford, London Agent.*)

England. **The Scarborough Co.**

Scarborough's Map of Lancashire, showing Ancient County, Administrative County, County Boroughs, Municipal Boroughs, etc. Scale 1 : 126,720 or 1 inch to 2 stat. miles. Ditto, Northumberland and Durham. Scale 1: 142,560 or 1 inch to 2·25 stat. miles. Boston, Mass., etc.: The Scarborough Co., [1905]. *Price 15s., mounted on rollers and varnished. Presented by the Publisher.*

Each of these maps is mounted on rollers and varnished. On the back is a general map of England and Wales. The style of production is decidedly rough, and the names, which are evidently typed, are in many parts confused and indistinct, specially on the maps of Lancashire and England and Wales. In the right-hand top corner of each is a geological map on a smaller scale. There is no acknowledgment of the source from which the maps have been drawn, but doubtless this is the Ordnance Survey.

Europe—Central. **K. u. K. Militärgeographisches Institut.**

Neue Uebersichts-Karte von Mittel-Europa. Scale 1 : 750,000 or 1 inch to 8·7 stat. miles. Sheets: G. 7, Banjaluka; G. 8, Cattaro; H. 8, Skoplje. Vienna: K. u. K. Militärgeographisches Institut, [1905].

Germany. **K. Preussische Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartographischen Abteilungen der Königlichen Preussische Landesaufnahme. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: (plain) 319, Beeskow; (brown hills and contours) 333, Detmold; 358, Brakel. Berlin: K. Preussische Landesaufnahme, 1905. *Price* 1.50 *mark each sheet.*

Iceland. **Thoroddsen.**

Hohenschichten-karte von Island. Von Th. Thoroddsen. Scale 1:750,000 or 1 inch to 11·8 stat. miles. *Petermanns Mitteilungen*, Erganzungsheft No. 152. Gotha: Justus Perthes, 1905. *Presented by the Publisher.*

The excellent survey work of Prof. Thoroddsen in Iceland is well known, and his researches into its geology and natural features have done much to make the interior of the island known to geographers Owing chiefly to his surveys, it is now possible to construct an orographical map with a fair degree of accuracy, although so little is known of many districts even now that it can only be considered a first approximation. The height of land is shown by nine shades of colour, ranging from sea-level to over 1500 metres. In the right-hand lower corner of the map is an inset of the island showing the cultivable land, deserts, and lava-covered areas, oases where grass can be found for horses, and glaciers. This map accompanies the first part of an important work by Prof. Thoroddsen on the geography and geology of Iceland, which is being published as a supplement to *Petermanns Mitteilungen.*

London. **Agas and Newcourt.**

Plan of London (*circa* 1560–70). By Ralph Agas. 8 sheets.—An exact delineation of the Cities of London and Westminster and the Suburbs thereof, together wth ye Burrough of Southwark and all ye Through-fares, Highwaies, Streetes, Lanes and Common Allies wthin ye same. Composed by a scale and ichnographically described by Richard Newcourt of Somerton in the Countie of Somersett, Gentleman. Engraved by Willm Faithorne. 8 sheets. London: London Topographical Society, 1905.

These two famous old maps of London have been produced in facsimile by the London Topographical Society with great care. Both are extremely interesting, but the Agas map is worthy of special attention. It will be remembered that one of the two known existing copies of this valuable map was kindly lent to the Royal Geographical Society in 1903 by the Guildhall Library, and shown at the Elizabethan exhibition arranged by the Society, where it created considerable interest. Richard Newcourt's map, about a hundred years later than that by Ralph Agas, is also most important from an historical point of view, and a comparison of the two maps is instructive as showing the change and extension of the city between 1570 and 1658. Both, of course, represent London as it was before the Great Fire. Facsimiles of these two maps have been previously published, and copies are in the Society's collection.

Switzerland. **Abteilung für Landestopographie, Bern.**

Topographischer Atlas der Schweiz (Siegfried Atlas). Scale 1:25,000 or 2·5 inches to a stat. mile. Sheet 42, Dielsdorf. (New Edition.) Bern: Abteilung für Landestopographie des Schweiz Militärdepartments, 1904. *Price 1 fr. each sheet.*

ASIA.

China. **Wade.**

The shooting districts lying between Wuhu and Shanghai, together with a map of the Ningpo Country, carefully corrected and partly surveyed by H. T. Wade. Scale 1:600,000 or 1 inch to 9·5 stat. miles With table of distances. Shanghai, 1903. *Presented by the Author.*

This map includes the country immediately south of the bend of the Yangtse, between Wuhu and Shanghai. It is chiefly intended for the guidance of sportsmen, and marks the districts where good shooting is likely to be obtained. Notes on the natural features of the country, and cultivation are also given. A list of distances in Chinese li and several pages of letterpress are given in a pamphlet which accompanies the map.

China—Tientsin. **Wingate and Turner.**

Map of Tientsin Prefecture and neighbouring Country, showing the course of Hai Ho-Pei Ho and Ta-ku bar to Yang-ts'un, and Yü Ho or Grand Canal. Scale 1:63,360 or 1 inch to 1 stat. mile. Compiled in the Intelligence Branch, North China Command, under direction of Lieut.-Colonel A W. S. Wingate, D.A.Q.M.G., and Lieut. F. G. Turner, R.E., July-August, 1903. 4 sheets. London: Topographical Section, General Staff, War Office, 1905. *Price 1s. 6d. each sheet. Presented by the Director of Military Operations.*

Persia. **Strauss.**

Thodor Strauss' Reiserouten im westlichen Persien. Scale 1:600,000 or 1 inch to 9·5 stat. miles. *Petermanns Mitteilungen*. Jahrgang 1905, Tafel 21. Gotha: Justus Perthes, 1905. *Presented by the Publisher.*

Herr Theodor Strauss's routes in Persia extend between Senneh, Kirmanshah,

Hamadan, Burudshir, Saweh, and Kum. The map is based upon route traverses made upon the journeys, and accompanies the author's paper in *Petermanns Mitteilungen*. A special note is given upon the pronunciation of the place-names, the spelling of which upon the map do not agree, however, in many instances with that adopted on the general map of Persia, which is given as an inset, taken from Stieler's Atlas.

AFRICA.

Africa. **Topographical Section, General Staff.**
Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. Sheets: 86, Albert Nyanza; 115, Andara. London: Topographical Section, General Staff, War Office, 1905. *Price 2s. each sheet. Presented by the Director of Military Operations.*

Africa. **Topographical Section, General Staff.**
Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: Gold Coast, 60-H; Northern Nigeria, 63-A, 63-M; East Africa Protectorate, 94-A, 94-B, 94-C, 94-D, 94-E, 94-F, 94-G, 94-H, 94-I, 94-J, 94-K, 94-L, 94-N, 94-O, 95-A; German East Africa, 94-M. London: Topographical Section, General Staff, War Office, 1905. *Price 1s. 6d. each sheet. Presented by the Director of Military Operations.*

Lagos and Southern Nigeria. **Topographical Section, General Staff.**
Lagos and Southern Nigeria. Parts of sheets 61, 73, and 74 of the map of Africa. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. London: Topographical Section, General Staff, War Office, 1905. *Price 3s. Presented by the Director of Military Operations.*

Liberia. **Topographical Section, General Staff.**
Liberia. Parts of sheets 59 and 71 of the map of Africa. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. London: Topographical Section, General Staff, War Office, 1905 *Price 2s. Presented by the Director of Military Operations.*

Sierra Leone. **Topographical Section, General Staff.**
Sierra Leone. Parts of sheets 58, 59, 70, and 71 of the map of Africa. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. London: Topographical Section, General Staff, War Office, 1905. *Price 2s. Presented by the Director of Military Operations.*

Tunis. **Service Géographique de l'Armée, Paris.**
Carte de la Tunisie. Scale 1 : 50,000 or 1·3 inch to a stat mile.. Sheets: xxxiii. Teboursouk; xxxiv. Bou Arada. Paris: Service Géographique de l'Armée, [1905]. *Price 1·50 fr. each sheet.*

AMERICA.

Canada. **Dept. of the Interior.**
Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets: 14, Pincer Creek, revised to October 12, 1905; 61, Lytton, revised to October 19, 1905. Ottawa: Department of the Interior, Topographical Surveys Branch, 1905. *Presented by the Canadian Department of the Interior.*

Central America. **Sapper.**
Geologische Karte des südlichen Mittelamerika. Von Dr. Karl Sapper. Scale 1 : 750,000 or 1 inch to 11·8 stat. miles. *Petermanns Mitteilungen*, Erganzungsheft No. 151, Tafel 1.—Geologische Karte von Honduras. Von Dr. Karl Sapper. Scale 1 : 1,000,000 or 1 inch to 15·8 stat miles. *Petermanns Mitteilungen*, Erganzungsheft No. 151, Tafel 2. Gotha: Justus Perthes, 1905. *Presented by the Publisher.*

In addition to the geological colouring, the relief of the land is shown by approximate contours, which, however, do not in the least tend to confuse the maps. In fact, this system of showing the general relief, combined with the geological features, is most satisfactory. At the present time so little is known of the geology of a great deal of Central America, that many blank spaces occur, but the amount of information given is a striking testimony to the excellent work Dr. Sapper has done in this part of the world. These maps and two sheets of geological sections accompany Dr. Sapper's exhaustive paper, entitled "Ueber Gebirgsbau und Boden des südlichen Mittelamerika," which forms a special supplement (Enganzungsheft No. 151) of *Petermanns Mitteilungen.*

CHARTS.

Chile. **Chilian Hydrographic Office.**

Chilian Hydrographic Charts. Nos.: 108, Seno Relongavi; 111, Magallanes. Senos Skyring i Otway i Canales adyacentes; 121, Puerto i Entradas de Quellon; (Provisional) 127, Taltal. Valparaiso: Oficina Hidrografica, 1905. *Presented by the Chilian Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for January, 1906. London: Meteorological Office, 1905. *Price 6d. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for December, 1905, and January, 1906. Washington: U.S. Hydrographic Office, 1905. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U S Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for January, 1906. Washington. U.S. Hydrographic Office, 1905 *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Antarctic Regions. **Charcot.**

Eighteen photographs taken by Dr. J. Charcot during the French Antarctic Expedition. *Presented by Dr. J. Charcot.*

Some of these photographs were published with Dr. Charcot's paper in the *Geographical Journal*, for November, 1905. Considering the conditions under which they were taken, they are remarkably good.

(1) Panorama of Wandel island, with the bay where the *Français* wintered; (2) The hut left behind at Wandel island; (3 and 4) Lemaire channel; (5) Cormorants; (6) Cape Renard; (7) Duke of Abruzzi peak, Wincke island; (8) Young penguins; (9) Mount William, Antwerp island; (10) Wandel island, (11) Wincke island and Neumayer's channel; (12 and 13) Anchorages at Wincke island; (14) Petrels, (15) Hovgaard island; (16) Icebergs, (17) The general store; (18) Toby.

Dutch East Indies. **Petrocokino.**

Forty-seven photographs of the Dutch East Indies, taken by A. Petrocokino, Esq. *Presented by A. Petrocokino, Esq.*

As will be seen by the titles, Mr. Petrocokino has visited some places in the Dutch East Indies that are not at all frequented by Europeans, hence the photographs he has presented to the Society will be specially useful.

Celebes:—(1–4) Makassar; (5) Street in Makassar; (6) Ox cart, Makassar; (7) Malay village near Makassar; (8) Avenue in Dutch part of Makassar, (9) Malay house, Makassar; (10) Native house, Makassar; (11) Native boys in Makassar; (12) Fishing village near Makassar; (13) Village near Makassa; (14) Goa; (15) Market, Goa; (16) Mosque at Goa; (17) Group of Natives in Goa; (18) Native children, Goa; (19) Paddy-fields in Goa; (20–22) Falls of Maos, near Marus; (23) Caog, opposite Falls of Maos; (24) River Marus, (25) Ferry over river Marus; (26) View near Maros. Lombok:—(27) Girls carrying tea-baskets, Mataram; (28–30) "Rajah's Baths," Narmade; (31 and 32) Ancient Hindu temples; (33) Native canoes. Banda: —(34) Landing-stage of North German Lloyd; (35 and 36) In Banda island; (37) Nutmeg-tree; (38) Native canoe; (39) Fruit market, (40) Walls of old Portuguese fort Bali:—(41) Market, Singaradja; (42) Street in native quarter, Singaradja; (43) Boelelong; (44) Market house, Boelelong; (45) Native canoes, Boelelong, (46) Hindu temple, Boelelong; (47) Gate to Hindu temple, Boelelong.

German New Guinea. **Petrocokino.**

Twenty-four photographs of German New Guinea, taken by A. Petrocokino, Esq. *Presented by A. Petrocokino, Esq.*

There are very few photographs of German New Guinea in the Society's collection, so these are especially welcome.

(1) Natives of Tumleo island fishing; (2–4) Natives of Tumleo island; (5) Native canoes, Silao; (6) Silao village; (7) Native huts, Silao; (8) Graves of native chiefs, Silao; (9) Native canoes, Friedrich-Wilhelms-Hafen; (10) Cotton tree and native canoe; (11) Breakwater near Friedrich-Wilhelms-Hafen; (12) Natives; (13 and 14) Native women; (15 and 16) Native village on island near Friedrich-Wilhelms-Hafen; (17–19 and 24) Matupi island; (20) Enlarged ear-lobe of native of New Ireland; (21) The beach, Matupi island; (22) Catholic school, Matupi island, (23) Native huts, Matupi island.

New Zealand. **New Zealand Government.**

Thirty-six photographs of New Zealand, taken by the New Zealand Government Department of Tourist and Health Resorts. *Presented by the Superintendent, New Zealand Government Department of Tourist and Health Resorts.*

Most of these are extremely good, and the subjects are varied and all interesting. They include geysers, waterfalls, agricultural products, Maoris, views of towns, and general landscapes, and together give a good idea of New Zealand life and scenery.

(1) Wellington; (2) Dunedin, looking south; (3) Wellesley Street, Auckland; (4) Newton from St. Matthew's tower, Auckland; (5) Felling kauri trees; (6) Mount Sefton; (7) Geysers at Whakarewarewa; (8) Wairoa geyser, Whakarewarewa, (9) Middle fjord, Lake Te Anau; (10) Waimangu geyser in eruption, (11) Cloves haystack, Arrowtown; (12) Queenstown, Lake Wakatipu; (13) Lake Wakatipu from Blanket bay; (14) Head of Lake Wakatipu; (15) Buller river; (16) Hawks crag, Buller gorge; (17) Mount Cook and Hooker river, (18) Lake Ada; (19) Looking up Milford sound from Windbound point; (20) Mitre peak, Milford sound; (21) Mitre peak and Sinbad gully, Milford sound, (22) Mount Daniells from Milford track; (23) Bit of Milford sound; (24) Looking up Francis Joseph' glacier from Sentinel rock, (25) Mahinapua creek near Hokitika; (26) Basin of mud volcanoes, Tikitere; (27) The Inferno, Tikitere; (28 and 29) Lake Manawapouri; (30) Cathedral peaks, Lake Manawapouri, (31) Rosy bay, Lake Waikaremoana; (32) Mokau falls, Lake Waikaremoana; (33) Aniwaniwa falls, Lake Waikaremoana; (34) Chaff-cutting, Cambridge; (35) Maraea, Maori girl; (36) "Hongi," Maori salutation.

North-West Frontier of India. **Marker.**

Fifty-five photographs of the North-West Frontier of India, taken by Major R. J. Marker, D.S.O., Coldstream Guards. *Presented by Major R. J. Marker, D.S.O.*

These photographs were taken by Major Marker in 1903, during his journeys on the North-West Frontier of India, including Gilgit, Chitral, and the southern frontier of Wakhan They are excellent platinotypes printed on rough art paper, with a most satisfactory result.

(1) Arrival of mail train at Mach, (2) Baggage camels; (3) Camp at Murgha Fakirzai; (4) Baggage camels coming into camp; (5) Zhob Levy Corps and guard tent at Kamardin Karez, (6) Group of Sirdars and Maliks of the Zhob valley, (7) Hussein Nikka fort; (8) Near the Gumal river; (9) In the Dana valley; (10) Group of Darwesh Khel Waziris near Wana; (11) The Dana river near Wana; (12) Village and tower at Ghurbaz; (13) General view of the Shawal valley; (14) Waziri ponies in the Shawal valley, (15) Fort at Datta Khel, Tochi valley; (16) Getting baggage over flooded stream near Sadda, (17) Frontier cairn between India and Afghanistan on top of Poiwar Kotal; (18) Sika Ram, the Safed Koh range; (19) Bridge over Jhelum at Kohala; (20) Village on the banks of the Jhelum between Baramula and Wular Lake; (21) The Jhelum in flood; (22) Bridge over Kishonganga between Gurais and Kamri pass; (23) Road up the Kamri pass; (24) On road between Gurais and Kamri Hut; (25) Barren hills round Astor; (26) The "Hattu Pier," part of the road between Astor and Gilgit, (27) Old Kashmir fort at Gilgit, (28) Kirkoen nullah; (29) Karakoram range; (30) Peaks of the Karakoram range; (31) Pope bridge near Sher Killah village; (32) Part of the Gilgit-Chitral road; (33) Road in the Dorah valley; (34) Fort at Barsin, (35) Wakhan frontier hills; (36) The Yarkhun river and valley; (37) Glacier near Yarkhun river; (38) Glimpse up a side valley from the Yarkhun river; (39) Mount Koi; (40) A Parri on the track close to the Baroghil pass; (41) The Dasht-i-Baroghil; (42) The upper waters of the Oxus; (43) Baggage yaks, (44) After crossing the Darkot pass; (45) General view of the descent from the Darkot pass; (46) Yasin fort and village; (47) Ferry over the Gilgit river at Gumatti; (48)

Reshun gorge; (55) Looking down towards Chitral.

Sarawak. **Shelford and Hose.**

Album of 170 photographs of Sarawak, taken by R. Shelford, Esq., and Dr. C. Hose. *Presented by R. Shelford, Esq., and Dr. C. Hose.*

This album forms a most valuable addition to the Society's collection. In the selection of the subjects great pains have been taken to obtain characteristic views and types, and their arrangement in the album has been most carefully studied. The representations of native sports, dances, customs, dress, and other subjects are all dealt with in a manner that only one who, like Mr. Hose, has lived a long time in the country could deal with them. The photographs are most excellent platinotypes, and are well described.

(1) H.H. the Rajah of Sarawak, G.C.M.G.; (2 and 5) The Astana, Kuching; (3) The

fort, Kuching, (4) Kuching from the Astana; (6) Public offices, Kuching; (7) Police station, Kuching; (8) The Museum, Kuching; (9) The Borneo Company's house, Kuching; (10) Square tower and jail, Kuching; (11) The sultan's palace, Brunei; (12) Brunei; (13) Kuching race-course; (14) The paddock; (15 and 16) The Sarawak Rangers; (17) Rough-hewing a blowpipe from a block of wood; (18) Kenyahs boring a blowpipe; (19) Testing the bore of a blowpipe; (20) Lashing spearhead to blowpipe; (21) Making blowpipe darts; (22) Collecting the juice of the upas tree; (23) Kayans collecting gutta-percha; (24) Camp of a Kayan hunting party; (25) A Kenyah hunter; (26) Kenyahs consulting sundial; (27) Kenyah women husking rice; (28) A Kalabit smithy; (29) A Tuba tribe on the Baram river; (30) Kenyah warfare; (31) Poling up the Pelagus rapids; (32) Rice-planting, Rejang District; (33) Sea Dayaks cock-fighting; (34) Kayans wrestling; (35) A Kenyah girl dancing; (36) Extracting the seeds of raw cotton in a cotton gin; (37) Spinning the thread; (38) Picking Lemba leaves; (39) Weaving; (40) Tama Bulan, a Kenyah chief; (41) Tama Kulieng, a chief of the Batang Kayan river; (42) Punans of the Tinjar river; (43) A Bakatan girl, (44) A Kayan woman carrying her child in a sling; (45) An Orang Bukit girl; (46) A Kajaman girl; (47) Laki Bo, a Kayan chief of the upper Rejang river; (48) Kayans, upper Rejang river; (49) Long Pokuns, upper Tingar; (50) Kalabit men; (51) Kalabit women; (52 and 116) Sea-Dayak women; (53 and 54) Lujai, a Ukit of the upper Rejang; (55, 63–65, 79, and 134) Sea Dayaks; (56) Kayan women; (57) A Bakatan (58) Sibnyau, of Lundu; (59 and 115) MacDougall falls, Baram river; (60) A rapid on the Paran river; (61) Bukit Batu; (62) Dapoi river; (66) Long Dapoi; (67) Head of the great rapid in the Rejang river; (68) Rapids of the Pata river; (69) A track through the jungle; (70) A Sea Dayak chief; (71) A Kelamantan of the Baram; (72) Trusan Muruts; (73) Land Dayaks of the upper Sadong river; (74) The upper Rejang; (75) Paran river; (76) A Long Kiput village; (77) Mouth of the Baloi Dalam river; (78) A Murik; (80) A Lirong; (81) The Baloi gorge; (82) Gehan Bakun; (83) A Sibop village, (84) Mount Dulit; (85) Punans, Tinjar river; (86) Lisum women; (87) Kenyah warfare; (88) Peacemaking, (89) Kenyah village; (90) A rapid on the Tutau river; (91) Long Asai; (92) Kenyahs on the warpath; (93) Aban Deng, a Long Wat chief; (94) Jama, a Sibop chief; (95) Kenyah of the Long Sibatu tribe; (96) Upper Rejang river; (97) Mouth of the Miri; (98) Awat-Awat; (99) The head house in a Land Dayak village; (100) Tama Usong, chief of the Uma Poh Kayans; (101) Oyong Nyarmg, chief of the Punans; (102) Siduans playing on the nose flute, (103) Malay playing on gongs; (104 and 105) Baram Fort; (106) Interior of Baram fort, (107) Camp on a gravel bed; (108) Lirong youths; (109) A Lirong girl; (110) Dayak warfare; (111) A Murut head feast; (112) The Baram river at Claudetown; (113) Bakun falls; (114) A Sekapan grave, (117 and 126) Kayans; (118) Kenyah women, (119) Sacrificial poles outside a Kenyah village; (120) Kayan woman dancing; (121) Bali Atap, the tutelary deity of a Sibop village; (123) An Orang Bukit woman; (124) Malay women; (125) Rejak, a Malay; (127) A Tanjong woman; (128) Punan's heads taken by Sea Dayaks; (129) A Sea Dayak head feast; (130) A Kayan obtaining fire; (131) Offerings to the omen-birds; (132) A Kayan and a Sea Dayak; (133) Land Dayaks; (135) The supports of a Kayan house; (136) Sea Dayak house in course of construction; (137) Interior of a Sibop house; (138) Interior of a Kayan house; (139) A Kayan girl; (140) Long Sibatu Kenyahs; (141) A Land Dayak chief; (142 and 143) Kenyah carving; (144) Interior of a Kadayan house with a meal laid out, (145) Bee-hives in a Sea Dayak's house; (146) Malayan arms; (147) Sea Dayak cloth; (148) Corsets worn by Sea Dayak and Land Dayak women; (149) Siduan baskets; (150) Sea Dayak currency, gongs and jars, (151) Kayan baskets; (152) Carved door in a Sibop house; (153) Skulls in a Kayan house; (154) Necklets; (155) Sea Dayak ornaments; (156) Murut hairpins worn by men; (157) Ear ornaments; (158) Malay lace pillow; (159) Sea Dayak coat worn by men; (160) Drums; (161) A Maloh guitar; (162) A Brunei gong; (163) Sea Dayaks' fiddles; (164) Harps; (165) Bamboo zithers; (166–168) The Orang Utan; (169) *Python Curtus*; (170) *Photodilus Badius.*

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder herausgegeben von Dr G. Karsten und Dr. H. Schenck. Dritte Reihe, Heft 4, Mittelmeerbäume, von Dr. H. Schenck; Heft 5, Sokótra, von Dr. R. v. Weltstein. Jena: Gustav Fischer, 1905.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

The

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ANTHROPOGEOGRAPHICAL INVESTIGATIONS IN BRITISH NEW GUINEA.*

By C. G. SELIGMANN, M.B., M.R.C.P., and W. MERSH STRONG, M.A., M.D.

Let me, in the first place, make it clear that the Daniels Ethnographical Expedition was in no sense an exploring expedition, and the results brought before you to-night are but the geographical gleanings of an ethnographical expedition. I cannot even offer you fearsome ethnographical details of

> ". . . the cannibals that each other eat,
> The Anthropophagi, and men whose heads
> Do grow beneath their shoulders,"

though we did hear of, but unfortunately had no opportunity of personally investigating, a tribe the members of which, before sitting down, scratched a hole in the ground with their spears to accommodate their tails.

For the purely geographical observations made to the west of Port Moresby, Dr. Strong is responsible, but he did not visit the Massim district. I am indebted for a very large amount of the material I have used in that section of the paper which deals with the south-eastern extremity of the island to the organizer and chief of the expedition, Major Cooke Daniels, whom I take this opportunity of thanking for allowing me to some extent to anticipate his results. My best thanks are also due to Captain Pim, who made the plan of Tokunu and Gawa and the sections of the islands of the Marshall Bennet group which are reproduced in this paper, and whose description of Kwaiawata I have quoted almost verbatim.

* Read at the Royal Geographical Society, December 18, 1905. Map, p. 324.

Thus, while I have not hesitated to draw on my colleagues for material, the responsibility for its presentation and for any inferences drawn from it must rest on myself.

Dr. John E. Marr and Messrs. W. G. Fearnsides and H. Woods have very kindly examined and identified the rocks and fossils mentioned in this paper, and to them my best thanks are due for enabling me to give a more coherent account of the districts visited than would have been possible otherwise. The majority of the photographs were taken by my colleague, Mr. A. H. Dunning.

The districts it is proposed to discuss to-night are three in number, viz.—

(1) British New Guinea, west of Bugi, *i.e.* the extreme west of the possession between Strachan island and the Anglo-Dutch boundary.

(2) The valley of the St. Joseph river and its neighbourhood, situated some 60 miles to the west of Port Moresby.

(3) An area in which raised coral masses are a prominent feature. This includes portions of the eastern and south-eastern administrative divisions, that is, the district which has been called by Dr. Haddon the Massim district.

The Western Extremity of British New Guinea.

On the trip to the western end of the possession, and the partial ascent of the Bensbach river at the Anglo-Dutch boundary, we had the advantage of accompanying a Government party, to the members of which our thanks are due for much courtesy and consideration. Three whaleboats, one of which we occupied, were towed by the steam-launch *Ruby*.

West of Bugi the country is a vast flat swampy plain, presenting for the most part a uniform edge of mangrove swamp to the sea, broken only by the mouths of sluggish rivers and creeks whose banks are as a rule covered with mangrove in the lower reaches. Here and there, however, a sandy foreshore occurs; this is the case at Wallarter point, the eastern extremity of Jerai bay, where behind a sand-beach there rises to a height of about 4 feet a plain of loosely compacted sand and grit, from the edge of which we obtained recent semi-fossil shells of land and marine genera *Helix*, *Arca*, and *Cerithium*. Some 40 miles west of Wallarter point the mouth of the Bensbach river appeared as a break in the green-grey mangrove line, which hitherto had stretched as far as the eye could see, marking the junction of grey sea and greyer mud. For the first 9 miles the banks are fringed with mangrove, and present the appearance of a typical rhizophora swamp; above this Nipa palms become common, and the mangroves disappear. A little beyond this the banks are raised at intervals as much as 2 to 3 feet above the river, and bear a fairly open jungle containing many eucalypti, some of which resemble the larger Australian ti trees. On one such raised

area our first camp was made. Further up, lengths of this kind of jungle alternate with open grassy swamps, which, without any definite margin, seem to fuse with the reeds and sedges of the river-bed.

Above this a few coconuts appear at some distance from the river-bank, and soon native gardens, with a few patches of forest trees, occur on the higher banks. Throughout the distance ascended, the river, which presents a very winding course, varies considerably in width, some reaches being very noticeably broader than others they alternate with. About half a mile up-stream from its mouth, Lieut. Meyjes, of the Dutch navy, found that the river was 150 yards broad, and had narrowed to between 50 and 60 yards, where the mangrove belt began to give place to other vegetation. After the first day's travel there was enough drifting weed to obstruct the screw and necessitate frequent stoppages to free it.

We met natives belonging to the Toro tribe on the third day of our ascent of the river soon after scattered clumps of coconuts had become frequent on the higher ground at a little distance from the river. Our camp was pitched on the right bank of the river, on a small knoll on which grew an isolated clump of bamboo.

The natives were living at a place which appeared to be called Tivi, some 3 miles from our camp in a north-easterly direction, and thus on the opposite side of the river. This was stated to be a recent, perhaps temporary settlement, made among the marshes on account of the fear inspired by Tugere raiders from over the Dutch border. The track to the village passed through extremely rich taro gardens, the ground being drained by many cuttings about 1 foot deep and 18 inches to 2 feet across. Tivi itself seemed a poor village, with few things except the bare necessities of life. The houses stood upon the ground, and were not more than 5 feet high and 9 feet long. Their rounded roofs were made of ti tree bark. All the houses were open in front; many were also open at their opposite end, so that they were, in fact, mere roofed tunnels. In the better-built houses the bark roof was continued over what must be regarded as the back of the house, to within 1 foot or 18 inches of the ground. These houses were, in fact, similar in shape and general appearance, but smaller, than one figured in the Annual Report on British New Guinea (1900–1901), described as a house in the village of Gwaigar, on the Morehead river.

The Toro, for this appeared to be the tribal name for these Bensbach natives, are spare and moderately tall, with thin legs and often thin bony faces, projecting zygomata, and marked supraorbital ridges. Facially, they seem to vary more than other western tribes, some of them closely resembling examples of the less intelligent European types. The hair of all was frizzly, and the nostrils were generally bored, in some cases in two places. In many these holes had become very small, so that the plugs that some men wore were evidently not considered

important articles of toilette. Their noses are generally long and coarse, with moderately broad ridges, and often coarse fleshy tips which are never hooked. Generally speaking, the Toro appear long faced.* In some of the older men the front teeth had gone, in others the fangs were exposed by receding gums, but in every case their teeth were white, and no sign of betel-chewing was seen, nor were any lime-gourds noted. One of their favourite attitudes was to stand on one leg, with the sole of the other applied just above the knee of the leg which supports the weight of the body; in fact, they assumed the attitude figured by Grogan for the Dinkas of the Nile swamps.

With the exception of nose, hair, and arm ornaments, most of the men went naked. A few, however, wore a pubic shell. These were said not to have been traded, but to have been fetched by the Toro themselves from the coast between the Bensbach and Morehead rivers. As a rule, the shells were not ground, or in any way worked, though in one melo shell the curve had been so ground away as to expose the columella. Even this scant covering was as often as not worn at the side of the hip or behind as in front. Many of the men had tinea, and the only baby seen had yaws.

The women, of whom we saw very few, wear two kinds of covering—one that is practically a perinæal bandage, as on the Fly, the other a true petticoat.

Their weapons are bows, arrows, and clubs. The latter were few and extremely rough, and were certainly imported. Their bows are made of bamboo, and with these they make fairly good practice, as the following details show: A target about 3 feet long and 2 feet broad was put up at a convenient height, at a distance of about 40 yards. Sixteen men had each one shot at this, and, though no hits were recorded, many of the arrows went very near the target. It appeared that the time the arrow took to traverse the 40 paces was between 1 and $1\frac{1}{5}$ seconds. Each of four of the best shots then fired four arrows, with the result that but one of these hit the target once. The same men shooting at 80 yards scored no hits; but there was no general falling off in the shooting, their arrows being pretty thick all round the target. Their bows were strung with strips of rattan, and their release is that known as "secondary."

During our stay we saw a fair number of canoes. These consist of a hollowed tree-trunk, pointed at each end, and with no outrigger; they pole along with bamboos. As far as we could determine, paddles were unknown. We saw none, nor could we hear of any; but in spite of this a good pace was attained even in deep water, their

* Measurements bear out the impression of variability already referred to. The cephalic index of twenty-one men varied from 69 to 86, with an average of 74 and a maximum below 74.

unsplit bamboo poles being used as paddles by men standing in the bows and stern respectively.

At Tivi we saw a number of tobacco-pipes of the same type as those common throughout the Possession; in spite of this, tobacco did not prove good trade. Their own tobacco was light coloured, and seemed extremely mild.

The only musical instruments met with were the drum and whistle. The latter consisted of an excavated nut-like fruit, and a note was produced by directing the breath into a small opening in the way that

A MAN OF THE TORO TRIBE, BENSBACH RIVER

a note may be produced with a key. The tympana of their drums consist of kangaroo skin, and the drums themselves were larger than those we had previously seen in this district. It should, however, be noted that far larger mammal-skin covered drums are said to be used some distance up the Bamu river.

The Toro are a totemistic folk, with descent of the totems in the male line. Perhaps the majority of the totems are birds. A number of palm-wood bullroarers were collected, but we could learn nothing about their use. Since, however, the Morehead river natives, whom the Toro closely resemble, use the bullroarer in their initiation ceremonies, it is probable that the Toro do the same.

THE VALLEY OF THE ST. JOSEPH RIVER AND ITS NEIGHBOURHOOD.

The area constituting the plain and delta of the Angabanga is inhabited by a number of tribes which may be grouped into three main divisions, according to the language they speak. The first of these, the Roro-speaking group, stretches from Kivori near Cape Possession to Hisiu, to the east of Cape Suckling. Hisiu and the neighbouring village of Nabuapaka are, however, comparatively recent colonies from Waima; and Delena, which is in part composed of the descendants of a Roro-speaking stock, should probably be considered their old eastern limit. The native name for Yule island, which is inhabited by that one of the Roro-speaking tribes which gives the language its name, is also Roro, but in this paper the island will be called by its English name, Yule island, and the term Roro will be used only when speaking of the tribe in question.

Inland of the Roro-speaking tribes is a region which may conveniently be called Mekeo. This is inhabited in the main by two closely related tribes, the Biofa and Vee. The villages of these tribes, once the coastal Roro-speaking zone is left behind, stretch up the broad valley of the Angabanga till the foothills of the main range are reached. Mekeo seems originally to have been a Roro, or possibly Motu, term, and to have been applied in the sense just indicated; but the term should be extended to include a small and uncertain number of villages on the upper reaches of the Biaru river, possibly originally populated by Biofa-Vee folk, and with whom the present-day Biofa-Vee of the St. Joseph river valley intermarry. The whole of Mekeo lies east of long. 146° 40′, and, with the exception of the Vee village, Inawabui Kipo south of lat. 8° 40′.

The lower portion of the course of the St. Joseph river, *i.e.* about the first 20 miles from its mouth, flows through a flat and often swampy country, much of which is liable to inundation. Yule island at its mouth is, however, hilly, while a series of low hills stretch from Pokama to and beyond Epa. An isolated hill of bare basaltic breccia exists to the north of Eboa. Upon this hill, in shallow caves and under overhanging rocks, are exposed the Eboa dead. A few low ridges exist to the north-west of Obo, and there is at least one other outcrop of bare basaltic breccia. North-west of Bereina the country becomes hilly, the edge of the hills at first running more or less parallel with the coast, which it afterwards approaches, till at Cape Possession (Waimatuma) the foot of the hills is washed by the sea. These hills are covered with more or less rank grass and scanty eucalypts, and carry a good head of wallaby. Behind Waima the hills are about 400 feet high and about a mile from the sea. Here a considerable creek, called Uirkapa, in part fringed with mangroves, runs near their base and separates them from the villages of the Waima clans. These hills

consist, at any rate in part, of raised coral reef, since obvious corals were seen in the rocks skirted by the track from Waima to Bereina.

Along the coast of Yule island are a number of caves. One of the largest of these is called Paavi. Its walls consist partially of a coarse sandstone, becoming clayey in places; at the mouth of the cave the rock has weathered hard, and from it we obtained a number of recent fossils. Among these Mr. Woods identified an *Ostrea*, a *Lucina*, and *Pecten pallium*. At another point on the island *Spondylus spectrum* was obtained, as well as *Pecten pallium*. On the floor of the cave there is a rich black mould, which a few yards from the mouth gives place to a loose sandy soil. A fair amount of the cave floor was turned over, but no signs of occupation were found.

Along the shore between Pinupaka and Waima the beach consists of sand. Extending for some distance from Pinupaka there is a mangrove fringe, which is never far behind the beach, and in places approaches the edge of the surf, while here and there mangrove stumps can be seen below the present high-water mark. Besides these, and bordering the shore above high-water mark for a considerable distance, there stand the still erect dead bare trunks of large mangroves, not *Rhizophora*.

The meaning of these mangroves is ambiguous, but, with other facts adduced, would seem to point to recent elevation, the trees being killed by the increasing upward deposit of sand which now forms the beach.

Beyond Waima, between Cape Possession and Oiapu, is a free cliff edge of hard rock, which rises for the most part almost vertically from the sandy beach. In this are embedded many corals and marine shells. Among others, Mr. Woods has identified *Conus parius*, *Arca Deshayesii*, and species of *Loborium* (Triton), and *Balanus*.

Dr. Marr and Mr. Woods point out that the fossils obtained from Yule island and from the cliff between Cape Possession and Oiyapu leave no doubt but that the strata from which they were collected are post-Tertiary, and must be regarded as recent. This view conflicts with that set forth by Mr. Gibb Maitland, and represented in his geological map of New Guinea, published in the Reports.* In the paper alluded to, he describes Yule island and the strip of coast country between Bereina and Yokea, the latter west of Oiapu as the former is east of Waima, as consisting of Tertiary "Port Moresby beds." It must, however, be remembered that at the time Mr. Maitland's account was published the fossils he collected had not been critically examined.

Eastwards and southwards of the Roro-speaking tribes is Pokao, a district of low hills and rolling downs intersected by narrow belts of forest in its shallow valleys, but in the main constituting a country covered with long grass and sparse eucalypts. In many ways it

* 'Annual Report on British New Guinea, 1891-1892.'

resembles the country round Port Moresby, but is less arid, and carries an abundance of game. Its language does not resemble Roro, while its social system, as far as it is known, is also different. In spite of this, Pokao and Waima have long been closely associated, the Waima folk making comparatively prolonged stay in the Pokao villages on hunting expeditions. The return for this hospitality might be, and often was, a gift of cocoonuts; but the intimacy between the tribes went further than this. A generation ago one Poa Oa of Waima excelled in carving, and much of the best work on the older Waima marea was done by him or under his direction. He was asked to come to their village by the folk of Diumana of Pokao, and to carve the posts of their club house. This he did, and although the loe, as the Pokao club houses are called, for which he carved the posts has recently been burnt down, the majority of the posts carved by him or under his direction are still to be seen at a short distance from the present Diumana site.

The folk of Pokao, at any rate in certain villages, are conspicuous for their often wavy and even almost straight hair; indeed, as far as our present knowledge extends, there is here a larger percentage of individuals with hair which is curly or wavy than elsewhere in New Guinea.

Following the coast-line, immediately east of Pokao is a marshy area through which meander a number of streams. Of these the Aroa is the most eastward of any considerable size, while on the west the Veimauri river opens into the head of Galley reach. The district between these rivers known as Kapadi, or Kapatzi, we did not visit, but were able to ascertain that it was peopled by a folk who are the descendants of a faction which several generations ago split from the Mekeo village of Afai, and after many wanderings settled in Kabadi. This information, obtained at Mekeo, was interestingly confirmed at a big feast given by the administrator, Captain F. R. Barton, to which all the accessible tribes of the central district were invited. Here we saw the men of Kabadi wearing, as they danced, the feather clan badges proper to the Mekeo and Roro-speaking tribes, and in this case derived from and representing the kangakanga of the former.

The social system of the Mekeo-speaking tribes, though presenting features of great interest, will be but briefly alluded to here, and that only sufficiently to render the scant information gathered by the Rev. Father Egidi concerning the mountaineers behind Mekeo intelligible.

The Mekeo tribes consist of a number of clans, representatives of which are as a rule to be found in several villages. A number of clans claiming common descent form a ngopu group. For each clan there was a group called ufuapie, into which, it was stated, its clansmen should marry, and which took a prominent part in the death rites of its intermarrying clan. Every clan had an iauafangai, generally a

plant, which it did not avoid eating, and a kangakanga, an animal or plant which would not be eaten, though it might be killed, and its feathers, or if it were a plant its dried leaves, would be worn by the clansmen when dancing. Apparently all the clans belonging originally to a ngopu group had originally the same iauafangai, and the same name for their club house (ufu). Each local division of each clan would have at least two chiefs, called lopia füa and io lopia. The latter was practically a war chief, and, except during actual warfare,

NARA WOMAN WITH WAVY HAIR.

his authority was greatly inferior to that of the lopia fua. Both offices are hereditary, with the practical limitation that no one not a successful warrior could in the old fighting days have been an io lopia.

The Lapeka, living some 10 miles west of Oriopetana, are a folk akin to the Biofa and Vee, and some of the clans now living in the Vee villages appear to have originally come from Lapeka. A few Lapeka visitors seen at Ififu closely resembled the Mekeo folk proper.

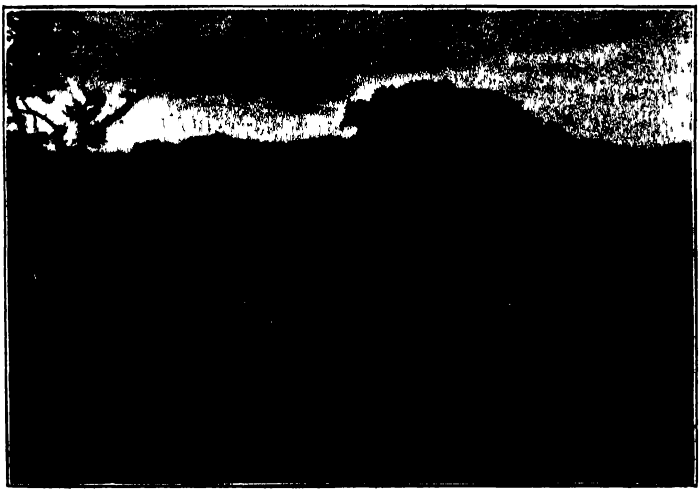
Of the mountains inland of the Mekeo plain our knowledge is more limited, but that at least two groups of tribes, at present ill defined, but speaking different languages, inhabit these mountains is clear. These are the Kuni and the Kamaweka, the latter being the tribal name applied by Captain Barton to the hill folk living in the

neighbourhood of Inauvorene. Dialects which, as far as our present knowledge extends, show no obvious similarity are spoken by these two folk, that of the Kuni belonging to the group which includes Pokao and Motu. In spite of this linguistic difference, the two folk are alike in general appearance and dress, the women in both instances wearing a narrow perineal band instead of a petticoat. Neither group appears to be homogeneous, since the cephalic indices of the Kuni (15) vary from 75 to 82, with an average of 78, while the Kamaweka (11) vary from 73 to 81, also with an average of 78. Both folk are shorter and darker than the people inhabiting the Mekeo plain, and their hair is always frizzly.

On leaving the Mekeo plain and going north-eastwards from Inawabui Kipo towards the Kuni villages, two species of oak with oval entire leaves and broad squat acorns were met with. Tree-ferns, too, were seen, but were not abundant. The road, the merest jungle track, often overgrown, lay up and down a number of clay ridges, all densely covered with old jungle. At the bottom of each of these a stream runs, and it is on the crest of such a ridge, reached at the end of a long day's walk, that Foloa, the Kuni village nearest the Mekeo plain, is perched. It consists or consisted of four wretched houses, and a marea surrounded by a frail palisade. A day's walk beyond this lies Emone, a larger and more important settlement. The village occupies the whole plateau of trodden clay, measuring some 150 by 30 yards, which constitutes the top of the hill. The houses are placed round this area, from which run a couple of paths passing steeply down the hill to the gardens and creek. There is a marea (club-house) at each end of the village, said to belong respectively to the two chiefs Makua and Kapulau; these are similar in structure, and 18 to 20 feet long by some 10 to 12 feet broad. The roof was square behind—that is, at the back of the house, but rounded in front overhanging the verandah. The roof ends some 5 feet from the ground, being in this respect unlike the dwelling-houses, in which the roof comes down to within a few inches of the ground. The marea is two-storied; the first floor, level with the verandah, is made of split areca-like wood, and is about 3 feet from the ground; the second floor is 6½ feet above the first. Three main poles hold up the roof, which is about 18 feet above the ground. Along the middle of the floor of both stories, and interrupted only by the central main pole, is a fireplace about a yard broad, consisting of a thick layer of ashes between palm-trunks. A couple of tree-trunks are lashed along the sides of each house about 2 feet from the floor of the second story; these serve as shelves, and, in spite of the slope of the roof, were generally tenanted by sleeping boys. The houses of the village are small and miserably built; they tend to be circular, and, when seen on end, give the idea of being so. One which was measured was, however, 12 feet long by between 6 and 7 feet broad.

The door is but a hole in the thatch, which comes low down. There is invariably a gap in the side of the house left for pig, and there may or may not be a raised floor of planks, partial or complete. There were twenty houses in the village. Bows and shields did not appear to be used, the only weapons we saw or could hear of being spears and clubs.

Concerning the social organization and the customs of these mountaineers, the only information I possess is that derived from a letter from the Rev. Father Egidi, of the Sacred Heart Mission, who has recently been stationed at Dilava, which is, he states approximately, in lat. 8° 35′ 15″ S., and long. 146° 53′ 45″ E.* He



A KUNI VILLAGE.

(From a photograph by the Rev. Father A. M. Fillodeau.)

points out that he could find no trace of intermarrying groups or groups of clans claiming common descent. The Dilava folk marry into all the surrounding villages, and when a death occurs it is the head of the family of the deceased who says when mourning shall cease. There appears to be no chiefship comparable with the system of hereditary war chiefs of Mekeo; any one who has killed his man and who has enough force of character may become a war chief, and this title implies no responsibility or specialization of function at feasts and ceremonies.

* I take this opportunity, on behalf of my colleagues as well as on my own, of thanking the Mission of the Sacred Heart for much help rendered and hospitality shown to us while working in the Roro and Mekeo districts. Among the staff of this mission, our thanks are more especially due to Mgr. de Boismenu and the Reverend Fathers Vitali, Egidi, Guibert, Cochard, Louis, and Pagest.

The ufu system seems less developed than in Mekeo. A peculiar ceremony is undertaken by the women and children of a dead man. These hold their face in the steam arising from a small pot in which is put a fragment of pork, while the rest of the village feast upon the pig from which the fragment is taken.

Of the Kamaweka of the Inauvorene district our knowledge is even scantier, and by the term Inauvorene district nothing more is meant than an ill-defined mountainous area north-east of Mekeo, some 20 miles from the Mekeo Government station, a portion at least of which is inhabited by the Kamaweka. It is reached by passing through Rarai and Ififu. Beyond the latter there is only a native bush track, at times difficult to follow. For the first six hours' walk this track passes through a swampy district, intersected by many creeks; over some of these the natives have constructed rude bridges by cutting down a tree standing in such a position that it could be made to fall across the creek it was desired to bridge. Towards the latter part of the first six hours' march the ground becomes covered with large water-worn stones, evidently brought down in the wet season from the hills. Near here the Biaru river is reached. When visited in 1904, the rainy season had scarcely finished, and the river was running swiftly with a depth of from 3 to 4 feet.

Near here the Ififu and Rarai people had built some ramshackle houses for their use when hunting and fishing. So far since leaving Rarai the track had lain through dense forest, which quite hid the surrounding country. A little distance beyond the native shelters a large branch of the Biaru is crossed, and the character of the scenery begins to change, and hilly country, with the Biaru flowing at the bottom of a gorge some 30 or 40 feet in depth, is soon reached.

The sides of this gorge are composed of rounded stones set in fine sand and gravel. It seems clear, before the Biaru had cut its present channel, it had flowed at a higher level, and had covered the country with washings from the hills. The path here keeps close to the river for some three hours' march, and then begins to steadily ascend, when the character of the ground soon changes. Instead of the ground being strewn with rounded pebbles, metamorphic rocks *in situ* are visible in the few places where the vegetation allows them to be seen. Some four hours beyond the native houses already alluded to is a sheer precipice some 30 feet high, which was descended by means of a bamboo ladder constructed on the spot. Probably this rock face was due to faulting. For a short time the path continues to descend, but it soon begins to rise again, and with few interruptions continues to rise, passing through dense forest almost until the top of a pass between the two Tulli peaks is reached. Beyond this lies a densely wooded valley with the Biaru flowing over its bottom. Beyond Tulli pass the road descends until almost the river-level is reached, after which it rises

steeply to the village of Inauvorene. This village is built on a ridge or grat, and, excepting on one side, is surrounded by precipices. A stockade surrounds it for the most part. The entrance to the village is on that side where there is no precipice, and here the second stockade has been built without the first. From Inauvorene several villages could be seen on the slopes of the opposite valley, at the bottom of which the Biaru river flows. By descending the slope of the Inauvorene ridge opposite to that previously ascended, and then travelling along the south-western slopes of the valley, the village of Ofafa was reached. The Kamaweka appear to be cannibals, and dispose of their dead by exposure on rough platforms in the forest.

WAGA AT TUBE TUBE; ENGINEER GROUP.

The Eastern and South-Eastern Districts.

At the south-eastern extremity of the possession our first prolonged stay was made at Tube Tube, in the Engineer group. This island, situated roughly halfway between the mainland and the Louisiades, supports one of the chief trading populations of the eastern archipelagos. The social system of these folk is substantially that which later we found to extend throughout a wide area in the eastern and south-eastern divisions of British New Guinea. Essentially this is a condition in which a community consists of a number of totemistic clans with descent of the totems in the female line. Each clan has at least three totems—a bird, a fish, a snake, and often a fourth, a plant. Each

clan in a given locality consists of a number of hamlets, each consisting of, say, from three to five houses, inhabited by a single family group. A number of such hamlets, scattered over a considerable area and inhabited by members of different clans, constitute a village.

One of the most interesting features of Tube Tube was a collection of waga, the large sea-going built-up outrigger canoes in which the men of Tube Tube made their voyages. The most careful inquiry failed to do more than elicit guesses as to the meaning of the carving with which the waga are ornamented. But since the Tube Tube folk knew that some at least of the waga were built on Murua, and since this was not far from the direction in which we must sail to reach the Trobriands, which Major Daniels had determined to visit, our journey from Tube Tube resolved itself into an island cruise in the track of the waga. And I may so far anticipate the order of our cruise as to say that waga are built not only at Murua, but also in the islands of the Marshall Bennet group, and probably, though to a less extent, at Misima, as they certainly are at Kiriwina.

Here, then, the waga are built and brought in one step or in a series of stages to Tube Tube, carrying with them almost always and wherever they go the original names given to them by their makers.* Without entering in detail into the technology of their building, it will be sufficient here to point out that these craft seem to represent the highest development of Papuan shipbuilding. Their length over all is often quite 50 feet, and their sides are built up with three or four broad hewn planks to a moulded depth of 4 or 5 feet, yet without a nail being used anywhere in their construction, and no wooden pegs are employed, except in connection with the outrigger. Nevertheless, the hull is strong enough to bear, not only the strains of heavy loads and high seas, but the even more trying stresses of continual beaching and launching. It is sufficiently rigid to hold the caulking in the seams, yet with a pliancy lent by its lashed fastenings which allow it to give when a rigid nailed fabric, unless enormously stout and heavy, would be very apt to tear itself apart and break up. The canvas of the waga consists of a single oval sail made of strips of pandanus leaf sewn together, while the ropes made, at any rate when repairs are necessary at Tube Tube, of hibiscus bast, form excellent stays and running rigging. Its size made the waga unhandy to paddle without a very large crew, or else at a very slow rate, and though a few paddles of the ordinary sort were carried, as well as the large one used for steering, they were seldom called into service, except in such an emergency as the wind failing and a current drifting the canoe into some position of danger. The craft was only intended to be used under canvas and for offshore work, or, as we should say, for deep-water

* The account of the waga here printed is condensed from Major Daniels' notes, as is that of Tokunu given on pages 240 and 241.

voyages. Tube Tube seamen aimed as far as possible to make a fair wind of it when they put out to sea, and the fortunate location of their island enabled them to go and come between many places during both seasons of the year, with at the worst a wind with which they could lay their course out and back. They could, however, work the waga to windward when their work lay that way, and although this was but slow travelling, their destination would be reached with speed enough to satisfy the easy-going natives.

The voyages of these folk are intensely interesting examples of primitive trading trips. Their crew always aimed to make a harbour every evening, and arranged their itinerary with this end in view, but they were not seriously disturbed if they had to spend a night at sea, either through failure of the wind, or when, as sometimes happened, they desired to reach a port more than a single day's sailing from the nearest starting-point. Without sufficient knowledge of the stars to sail by them at night, they could, in their island-strewn sea, if the weather were clear, generally see some land to guide them, and so kept on their way. If the night were thick, they lay to where darkness overtook them and waited for daylight. The storms of the north-west monsoon were probably the severest trial to their seamanship, for furious storms come up then almost without warning. These are, however, only of a few hours' duration, and when good management or good luck did not give them a haven somewhere under their lee, they downed sail, keeping the waga head to the sea, and rode it out as best they might. And what with good ships and good handling they must have had very few disasters, for we could not hear of a shipwreck within the memory of the oldest man on the island. Their trade route to Murua, where, it will be recollected, many of the waga were built, was, as they made it, about 120 to 135 miles. They would usually go during the monsoon and come back on the trade, as those winds served their itinerary best. Presuming that wind and weather served them throughout the passage, they slept the first night on an island called Ore, a couple of miles or so from Dawson island, the next night they made Panamoti, the third night they slept at Tokunu (the Alcesters), and by the fourth night they might reach Murua. As a matter of fact, this ideal passage was seldom or never made, and it was not at all unusual for canoes to be a month or more from Tube Tube to Murua, either because the wind and weather delayed them, or because the crew simply did not care to hurry themselves or found business to do *en route*.

Exports to Murua were varied, but included pots, and imports from there included stone implements and shell money (*sapisapi*). A considerable amount of food was brought to Tube Tube from Milne bay, a voyage which took two and a half to three days. They also made frequent voyages to East cape, South cape, and to Dobu, the latter being the island from which the Tube Tube people originally came.

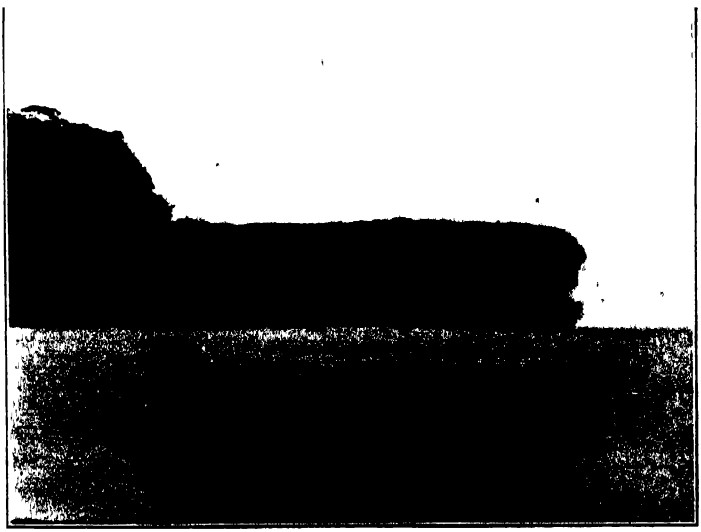
The details just given, taken from Major Daniels' manuscript, embody information furnished by men who evidently had actual voyages in mind when they spoke. The time occupied for any journey but the very shortest was, however, different each time the voyages were made, and it is certain that the routes were often varied to suit some special commercial object. The specimen of the voyages given will serve to convey an idea of the nature and extent of this people's wanderings in pursuit of trade, and the number of places along their route with which they were at one time or another at war throws a lurid light on the courage and diplomatic skill without which they could never have gone so far or accomplished so much. We did not visit Wari (Teste island), but it did not seem to us that any other south-eastern natives we met had just the qualities of the Tube Tube folk, who sailed the troubled commercial waters and rough seas with something of the insouciance of the English merchant venturer of Elizabeth's days; laden for trade, but armed for combat, their spears were quite as sharp as their wit, and they themselves equally ready to use either as circumstances might require.

On leaving Tube Tube, we sailed for an island called Ore, whither the folk of Panamoti, who at times were said to act as the middle men in the matter of procuring waga for Tube Tube, had recently moved. As a matter of fact, we made Gabuyene, about 2 miles from Ore, where there are two small villages of Panamoti folk. Both Ore and Gabuyene belong to the Laseinie group. From Gabuyene we sailed north-eastward in the direction of Murua, anchoring on the first night after leaving Gabuyene off the Bonvouloir reefs. These are not as figured on the chart. A portion of the system, perhaps that alluded to in 'Sailing Directions,' consists of an oval atoll, which appears to be about a mile and a half long by three-quarters of a mile broad. On the windward side of the atoll are three low densely wooded islands, oblong in shape, one of which is Panamoti. There are a few small masses of reef and detached coral rocks to the east of the most easterly of these. On the lee side, near which we anchored, the reef is 2 to 4 feet deep at high water, and consists of land studded with rounded isolated masses of coral. The lagoon appeared to be from 4 to 6 fathoms deep.

From the Bonvouloir reefs we made Sharp island *en route* to Murua, but, the weather proving thick, we put back to the Alcester islands. These, marked "position and extent uncertain" upon the charts, consist of two elongated flat-topped islands, which are densely vegetated. They rise at their highest point, at the eastern end of the larger island, to a height of some 180 feet above the water. The bigger island, called Tokunu, presents one small cove, in which nestles a village—that is to say, seven houses divided into four groups, each group belonging to and inhabited by men of one totem. In the 'Sailing Directory of the Pacific' it is stated that Tokunu "is inhabited by a roving tribe of

natives, who are reputed to be the most skilful canoe-builders in this part of the Pacific."

This information appears to have been gathered from the Report for British New Guinea for 1888, which contains a statement furnished to the Special Commissioner by Mr. W. Whitton. In this it is stated that many large canoes [waga] are built at Tokunu, and that there are no gardens on the island. The latter statement is certainly incorrect, and we have no reason to believe that waga are or were built at Tokunu. In fact, all the evidence points the other way. The present small population of Tokunu has been alluded to, while there is but scanty space on the strip of beach which constitutes the landing-place for the



TOKUNU. WAVE-CUT NOTCH IN CLIFF ABOVE PRESENT SEA-LEVEL.

building of any large canoe, and were there space it would be difficult to understand how the timber could be got into position, since the raised coral cliffs of which the island consists are elsewhere practically sheer. At the cove the cliff is roughly 100 yards from the sea, the intervening space being a sharp slope of broken, highly crystalline coral rock, filled in with black mould, and thickly forested. There is no appearance of stratification in any part of the cliffs of the island. At sea-level the cliff is slightly undercut, while there is similar evidence of wave-action in many places many feet above the present sea-level. A profile view of what was apparently a wave-cut notch many feet above present sea-level is shown above. On both the windward and

leeward sides of both islands there is no fringing reef proper, and the islands are very steep too; but in certain places, sometimes off points, sometimes in bays, the water for 50 to 300 yards from the shore sloped gradually to 12 fathoms, with a bottom of coral sand and mushroom-shaped coral patches.

From a distance the island appears flat topped, and the cultivation ground in the centre of the western part, where the forest has been cleared from at least 300 acres, is remarkably level. The same conditions prevail in the forested parts, except that there is a slight rolling uplift along the leeward side, probably not over 4 to 5 feet high and 100 yards wide. On the windward side, very near the cliff-edge, and roughly following its present contour, is a ridge 8 to 15 feet high and 200 yards wide, of apparently tumbled coral masses. The whole top of the island is much weathered, low coral boulders everywhere making walking very difficult. The vegetation is luxuriant, consisting of great forest trees with far-spreading buttress roots, with but little undergrowth in the uncleared portions of the island. In the face of the cliff, whether on the windward or leeward side, there are numerous vertical cracks running from top to bottom, at intervals of, say, 30 to 200 yards. The cracks are narrow, certainly not more than 2 feet wide until 10 to 20 feet above water-level, where the undercutting action of the sea begins; here they widen out into caves from 3 to 10 feet wide, evidently running many feet back. The only path to the top of the island ends in 25 to 50 feet of what is practically an easy chimney climb. On the weather side of the island a long talus was noted at one spot; this was covered with pandanus and casuarina—elsewhere the latter plant was decidedly uncommon.

(*To be continued.*)

BRITISH EAST AFRICAN PLATEAU LAND AND ITS ECONOMIC CONDITIONS.*

By Major A. ST. HILL GIBBONS.

It will be remembered that some two years ago an offer of a considerable tract of territory was made by His Majesty's Government to the controllers of the Zionist movement. The principle involved in this offer is quite exceptional, whether viewed from an economic or an administrative standpoint. An autonomous province under a Jewish administration—but subject in certain respects to the control of the Administrator of British East Africa and the Home Government—was to be created within our East African empire. With the political aspect of the offer I have not—nor had I at any time—anything whatever to do, but all must agree that in this respect His Majesty's Government

* Read at the Royal Geographical Society, January 15, 1906. Map, p. 324.

could have been actuated by none but the highest philanthropic motives. Economically speaking, my view is that a most interesting colonizing problem was involved, for had the scheme been carried through in the spirit in which the offer was made, scientific experiment combined with methodical industrial development should have provided useful object-lessons both to those who settle on the land, and those who control the destinies of our infant colonies.

One of the first conditions imposed in connection with this offer of territory was that a commission approved by His Majesty's Government should proceed to East Africa with instructions to examine the Guas Ngishu plateau—the special territory offered—with a view to reporting on its adaptability to purposes of European agricultural settlement. It was as chief of this commission that I was able to collect the subject matter of this paper. One of my colleagues—Herr Kaiser—was a gentleman of considerable scientific knowledge. As botanist and geologist, he had previously visited Northern and Eastern Africa with the German explorers Schweinfurth and Schoeller. While serving with the latter expedition he had traversed the southern part of this same Guas Ngishu plateau. My second colleague was a gentleman who had never before travelled in Africa.

We landed at Mombasa on January 13, and the following afternoon entrained for Nairobi, having with us the whole of the expeditionary equipment, personal servants, a headman, and a nucleus of ten porters. Feraji, the headman, had crossed Africa with Stanley, and since then had been largely employed on "safari" in East Africa. A single day at Nairobi gave time to arrange matters with the commissioner, the late Sir Donald Stewart, and to augment the caravan to about sixty the minimum strength I considered adequate for purposes of transport and private service. We reached Nakuro late on the 17th, and on the following day—the fifth since landing at Mombasa—the entire caravan started with loads for the Eldama ravine.

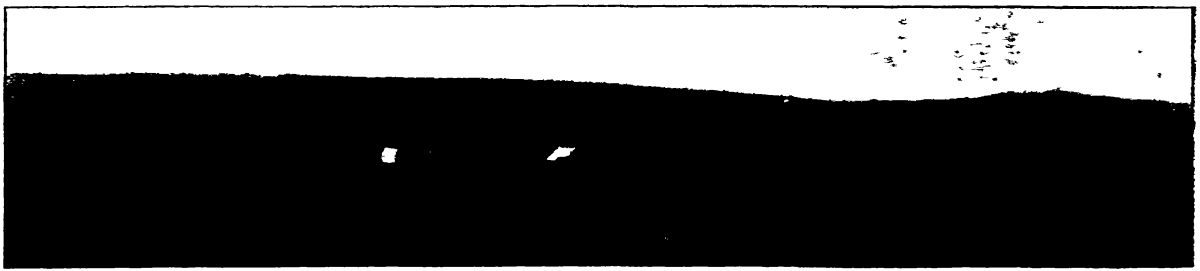
The first day's journey from Nakuro along the Great Rift-valley is dry and shadeless, there being no water until the little Rongai river—19 miles away is reached. This does not flow into the Molo, as shown in the existing maps, but about 6½ miles north-east of the crossing of the caravan-route all trace of a bed ceases, and the river itself disappears below ground. The water of the Rongai is good, and even at the end of the dry season has a strong flow. An ascent of 1500 feet during a march of 20 miles brought us on the second day to Eldama ravine. The Government station stands in an ideal position on the summit of a steep ascent of some 200 feet, and is all but 7000 feet above sea-level. Though it stands only 3′ 25″ north of the equator, the Ravine has the reputation of being the most temperate—not to say the coldest—station in the protectorate. There are few healthier spots in Africa or elsewhere. The view is superb. Mount Eldalat, the Mau, the Kamasia

mountains, and the great rolling forest-clad hills which at 8000 feet form the escarpment of the Guas Ngishu plateau, supply on all sides the background to a heavily wooded undulating country, occasionally relieved by open patches of good natural pasture and the rich red face of the ravine from which the station takes its name. From the Ravine to the south-eastern extremity of the plateau a track through the dense virgin forest—available for foot-passengers only—has been cleared of undergrowth. This leads over steep undulations, each as a rule attaining a higher altitude than the one previously traversed, until finally, after a fair day's march, the forest gives place to a magnificent country of open rolling downs, capable of becoming a great cattle district. Thus on quitting the valley immediately to the west of the Ravine station, the altitude of which is about 6500 feet, the traveller finds himself, in about half an hour, in the Langas valley, at 7410 feet above sea-level; he follows this stream for over a mile, and then commences a rapid ascent of 750 feet; next he drops 450, then up and down and up and down, until he stands, at a height of 8650 feet above sea-level, on what is apparently the highest undulation within a comprehensive view. One or two hills at the southern extremity of the Elgeyo escarpment rise a few hundred feet above this, but, excepting Elgon with its 14,200 feet of altitude, and some of the higher peaks of the Chibcharagnani or Chipchangwane mountains—seven good days' march to the north—these south-eastern undulations eclipse in altitude the many considerable hills which, later on in our journey, supplied such excellent landmarks and useful points of observation.

During the first day's journey over these invigorating highlands we crossed the path by which Major (now Sir Ronald) Macdonald traversed the plateau. His name and those of Schoeller, Pringle, and Austin represent the only expeditions which had hitherto visited Guas Ngishu for purposes of geographical research, and their combined work was restricted to a triangle in the southern section of the plateau. Major Austin also passed along the eastern base of Mount Elgon, and the mountain itself, whose towering mass may be seen on a clear day from any part of the plateau from where it is not obscured by intervening obstacles, has been visited at one time or another by protectorate officials and others, notably by Sir Harry Johnston, whose interesting account of his experience created in me a wish that Elgon had been within the scope of our inquiry, or that the time at our disposal had not been so limited as to preclude the possibility of my climbing to the crater.

The first camp on the plateau—8500 feet—was on the fringe of a wide alluvial valley, which will doubtless be ultimately turned to useful agricultural account. Down the centre of it flows the little Kibuyno river, and this, a few miles further, joins the Nesoi—a stronger stream, which a mile beyond the confluence plunges over the Elgeyo

GUAS NGISHU PLATEAU, NEAR ELGEYO



GUAS NGISHU PLATEAU, LOOKING EAST.

escarpment into the Kerio valley 3000 feet below. Next day we reached what seemed to me to be the ideal spot at which to camp for a few days, while Feraji, the headman, returned to the Ravine for further supplies. Camp was pitched about 30 feet above the springs of a small affluent of the Leosos, known as the Samabula. Beyond the stream, and about 100 yards to the east, were the borders of a considerable patch of primeval forest; to the west alternative grassy undulations and narrow valleys marked a falling away in altitude from 8000 to 7000 feet within half an hour's march. Obviously, the collecting of grasses and a careful examination of the various timbers and plants in the forest would suffice to keep our botanist, Herr Kaiser, thoroughly occupied. For myself, I saw an opportunity, by means of a series of short excursions, not only of studying the material and economic prospects of the district for some miles round, but of laying the foundation of a reliable survey of the plateau on as comprehensive a scale as the few weeks allowed us would permit.

Some 70 miles to the north-north-west a good view of Elgon could almost invariably be obtained in the early morning, and on the summit is a definite point which I take to be the north-eastern face of the crater. Slightly to the west and east of north, and 25 and 30 miles away respectively, were Mount Sirgoi and Karuna hill, and beyond these was a prominent peak of the Chipchangwane range, while the group of hills of which Mount Ildalat is the most noticeable breaks the plain 25 miles to the north-west. By a series of observations on north and south stars, I hoped to find the latitudinal positions of each of these points, and also, so far as those lying on my northerly route were concerned, to determine the exact relative distance of each to the others. With this line of bases for purposes of triangulation, I was sanguine that numerous and carefully read compass bearings must give a good result, and, as a commencement, I devoted much of my time during the next few days to taking bearings on my points from different positions, in order to assure myself that no local variation interfered with the accuracy of the result. The one condition which gave me anxiety was the state of the heavens, for every night since leaving Nakuro the stars had been obscured by clouds.

On one occasion I decided to make a day's excursion to the Elgeyo escarpment, which, as forming the eastern boundary of the territory in question, was a feature of some importance. I took with me three boys and a Masai, who, as one of three professing a knowledge of the plateau, was engaged at the Ravine as a guide. Crossing the stream near camp, we passed through the adjoining belt of forest to the park-like country beyond, where small patches of forest gave relief to the rolling downs characteristic of the country. Two miles of this brought us to the outskirts of a forest which seemed to stretch far to right and left. My Masai guide had his work cut out for a couple of hours or more, as,

with the exception of a half-mile opening along the borders of a marshy stream, every step of the way was contested by an entangled and at times prickly undergrowth. I found ample compensation in the view suddenly encountered on emerging from the forest. So dense are these East African forests up to their very borders, that one frequently does not realize the existence of open country until within half a dozen paces of stepping into it. Such was the case in this instance, and no doubt the sudden contrast in light to some extent enhanced the beauty of the picture in front of me. To the left and left front was apparently illimitable forest; immediately before me a grass bank sloped down to a strong stream, which proved to be the Nesoi; beyond was the face of a second steep undulation, open for the most part, but dotted here and there with small groups of great trees wrapped in vines and under-scrub; while flowing directly towards us from the east was the little Kinuyno, speeding its course in a series of glistening cascades to join the Nesoi on its journey into the great valley beyond the escarpment.

Crossing the Nesoi, I took lunch in a shady spot above a small waterfall, and then proceeded to skirt the forest in an easterly direction until we struck a well-defined native path at the base of a hill whose slopes were covered with forest, but whose summit was clear. This we climbed for some 2000 feet, passing, when near the summit, through thick bamboo forest. From the crest of the hill I could not see as much as I had hoped for, as all distant points to the north-west were obscured by intervening hills. However, I obtained a good view of the south-eastern line of the escarpment, as well as of two important points to the south-west. While descending the hill we encountered two natives, who informed us that they lived in the Kerio valley. Lithe, active-looking fellows of medium height, these people are somewhat extravagantly decorated with beads, wire, and charms. They drape their shoulders with skins, but ignore clothing elsewhere. Their hair is well greased into ringlets with a preparation of fat and red earth, and they carry spear, bow, and arrow. Occasionally during my subsequent journey I met with small hunting parties of these tribesmen, but with the exception of the remote fastnesses of Elgon and the Chipchangwane mountains in the north, I doubt whether a human habitation exists on the plateau at the present time. Occasionally the ruins of unmortared stone walls remind one of the previous existence of a population. That a branch of the Masai race at one time occupied Guas Ngishu is accepted as beyond doubt, and it is also an established fact that their brethren of Naivasha cleared the plateau of settled inhabitants, but so varied are the accounts of this depopulation, both as to time and detail, that the story of the tragedy is largely conjectural. It is, I think, probable that thirty to forty years have elapsed since the plateau became the grand wilderness it is to-day. The people who

occasionally roam over it for purposes of hunting or depredation are in no way akin to the Masai. Those already described hunt game in the neighbourhood of the Elgeyo escarpment in small parties of six to a dozen. They are harmless, timid, and well disposed. The Nandi and their kindred the Kamasia are more predatory in their habits, and are not above acts of robbery when they see their way to perpetrating them with impunity, and, as can be imagined, the dense forests offer exceptionally good cover to those who desire concealment. On the return journey I avoided the forest by making a southerly *détour*.

Cloudy nights continued until the second night before striking the Samabula camp, but from that time onwards until our return to Nakuro the heavens smiled upon us, for I seldom missed a night without taking at least three observations for latitude.

I now decided to put into practice the system on which I have always worked in Africa, *i.e.* allot to each his sphere of action, and leave it to him, untrammelled by others, to carry out his own work in his own way and to his own credit. While I travelled as far north as practicable, and then, gradually trending to the left, described a large circle, my general instructions to Herr Kaiser were, first, to form a base camp as near as water would allow to Mount Sirgoi, a landmark unmistakable from any position in the centre of the plateau; and, second, to visit the lower slopes of Mount Elgon, where interesting botanical and geological results might be expected. Although not possessed of any other surveying instrument than a compass, I trusted that on this plan, since his path would of necessity cross my route twice, his journey would supply a useful addition to the map. Unfortunately, this second condition was not realized, and for this reason I am compelled to accept sole responsibility for the map I place at the disposal of the Society. To my second colleague I gave a free hand.

My instructions to my Masai guide on recommencing the journey were that we would bear north-north-east until we struck the Elgeyo escarpment, which I was anxious to visit. I should state that from the southern point of the escarpment to as far north as the eye could reach from points of vantage near my northernmost camp, there extends a belt of primeval forest varying in width up to 8 or 9 miles, and probably wider in the extreme north. Through this a few hunters' paths lead from the plateau to the valley below.

On this occasion my guide started off in the right direction, but later I noticed a distinct tendency to bear westwards. More than once, when paths branched to right and left, and he chose the latter, I protested that it was to Elgeyo, and not to Sirgoi, that we would go, and each time I received a plausible explanation. When towards evening we collided with Herr Kaiser's caravan, and I discovered that we had been led by a circuitous route to the direct road to Sirgoi, things came to a crisis, and the delinquent walked into the forest and

sulked. I once more bade adieu to my colleague early next day. This time I took the lead, and the guide followed. Half an hour brought us to the edge of the forest, giving a direction slightly north of east. On the average we made progress at the rate of about a mile an hour, being occasionally helped during the afternoon by a network of elephant tracks, most of which were useless to us, as they led to the north and north-west, though a few ran north-east for short distances, and of these we took full advantage. The sun had been down ten minutes when we stepped into the open from a patch of bamboo forest. The aneroid indicated 8600 feet above sea-level. Before us, and apparently covering an area of about 1000 acres, was undulating grassland, occasionally relieved by small clumps or strips of forest trees. A steep slope led to a strong mountain stream of clear cool water flowing westwards. This was apparently the Algarenye, a southern tributary of the Nzoia system. Next morning, on approaching my washing-basin, which always stood outside the tent, filled overnight ready for my morning ablutions, I found the surface to be a sheet of ice about a quarter of an inch thick. The sun had already been up over half an hour when I examined the minimum thermometer. Unfortunately, the spirit had separated, and no indication was left of the minimum night temperature. Two other thermometers at the time showed that there were still two degrees of frost, so that probably six or seven degrees could have been registered in the small hours of the morning.

That day I went in search of the escarpment, and in an hour and a half reached it at a spot where the overhanging trees obscured everything but the fact that an almost abrupt precipice lay at my feet. After travelling north-north-west for a further 2 miles, we struck a native path, which led to an open space. When 200 or 300 yards from the escarpment this second time, a great murmuring noise was to be heard ahead. It increased proportionately with our advance, and in a few minutes I fully expected to gaze on a great waterfall plunging over the brink of the escarpment. In a few moments I stood in a position which could not fail to impress the most apathetic temperament with a sense of Nature's grandeur. It is true my waterfall, which would have added lustre to the scene, had proved a myth. I had merely heard a heavy wind striking the face of the precipice below me, and, thus turned upwards, disappearing into space without so much as disturbing a leaf a few paces from where it dashed impotently against the red-faced cliffs. To the left, a slight curve in the alignment of the escarpment gave the opportunity I looked for to determine for some miles northwards the eastern limit of the territory I had come to examine. In front, I looked straight down without a break into the Kerio valley 3000 feet below me. The scene had the appearance of a great map in relief, with its hills and valleys, its main river-bed and subsidiary watercourses. The Kamasia mountains, which from the

Rift-valley beyond rank as a considerable mountain range, were dwarfed by the height, from which they were seen 20 miles away. Another 40 miles beyond, the dim blue outline of Laikipia was clearly visible. Next night was spent in the open not far from the previous camp, where clouds had obscured the stars just as I was preparing for a series of observations. On this second night, however, fortune smiled on me, and I was able to fix my position. In this neighbourhood the turf was in places intermingled with clover, and a tasteless raspberry also grows. Perhaps the most striking feature is the beds of white everlasting flowers through which a path had occasionally to be cut. It took a day and a half travelling in a westerly direction to clear the forest on the return journey, though fortunately a small open space—the only one encountered—supplied a convenient camping-ground, from which I was again able to determine my latitude.

On reaching the open, direction was changed to the north, and for a day and a half we passed over downs similar to those already described. Starting at about 8000 feet, with the forest belt on the right and the ground falling away to a vast plain on the left, we gradually dropped to 7400 feet, and camped near Karuna hill, on the edge of the plain itself. Here the ground was dry and the vegetation parched, and it was found necessary to send 2 miles for water. A porous lava was visible in many places, and at best but a thin layer of surface soil covered the rocks.

Four miles north of Karuna we had ascended over downs to an altitude of 7750 feet, and then, in something less than a mile, had dropped nearly 300 feet, and were following the base of a ravine, bounded on the east by a steep heavily wooded slope leading to a continuation of the high ground left behind, and to the west a long hill culminating in five rocky summits, and in reality a spur of the Chipchangwane mountains. Our descent to the lower level had brought us into a broken, hilly district, the existence of which had not been suspected a quarter of an hour earlier. A river, which without doubt is the parent stream of the Nzoia system, skirts the eastern base of this hill, and, rounding the southern extremity, takes a westerly in place of its hitherto southerly course. The next few days disclosed the fact that the depression we had entered extends to the western side of the plateau, where it is lost in the gradual decline to its level of the southern plain. It is triangular in shape, and is much broken by stony kopjes and steep hills. A fault running east and west separates it from the plain; the Chipchangwane mountains bound it on the north-east. Following the Nzoia for a few miles, during which progress was very difficult owing to the entanglement of forest undergrowth enshrining every small tributary to be crossed, the absence of native or even game tracks, and the long coarse growth of grass, much of which attained a height of 6 or 7 feet, we finally crossed to the right bank of the

river (which was about 15 feet wide by 2 feet deep), and pitched camp near the northern end of the hill previously described. Next morning I climbed this hill, while the caravan worked its way round the northern base. The summit commanded an extensive view of the country around. To the north a bold rough country presented itself to my view, where a great group of mountains lay back for many miles, some apparently attaining an altitude of 10,000 to 12,000 feet. One was abrupt and rugged, another of a gentler gradient, a third faced by a great red precipice, and so forth. The general character of the vegetation was grass and scrub, but here and there a hill is covered, or partially covered, with dense virgin forest. It is grand but inhospitable, and probably will remain so long after the neighbouring plains are dotted with homesteads and covered with cattle. To the north-east and east there appeared to be interminable forest, interspersed at rare intervals with small patches of grassland. To pass through this and round the northern base of the mountains as I had hoped to do would require much more time than was allowed me, so I decided to travel along the fringe of the Chipchangwane range in a north-westerly direction. For two days we passed through a mountain valley entirely given over to the beasts of the field. Game was plentiful, and I have never heard so many lions at any one place as I did round my second camp in that valley. The four succeeding days we travelled along high pathless mountainous ground until within 10 miles of the eastern base of Elgon. The satisfactory feature of this part of the journey was that, not only did it take us across the upper waters of the whole of that section of the Nzoia system emerging from the Chipchangwane range, but from the many hills passed over I was able to get a fairly accurate idea of the general flow of the system. I was particularly surprised to find so much water flowing at the very end of the dry season; many streams within quite a short distance of their sources were from 15 to 25 feet wide and 1 to 3 feet deep. Before turning southwards I climbed a hill which commanded a good view of the country as far as Mount Kisimachanga– a north-eastern spur of Elgon connecting that mountain with the Chipchangwane group—as well as of the whole valley to the west and south-west. Immediately between Elgon and where I stood was a belt of undulating grassland some 10 miles in width; to north and south of this a scant acacia savannah extended as far as the eye could reach. On the slopes of Elgon there appeared to be samples of everything already described as existing on the plateau--first savannah, then alternate grass and virgin forest, and above that the rugged boldness characteristic of great mountains. One thing was very noticeable, viz. that the area of plateau-land between the bases Elgon and the Chipchangwane range is only about one-half of that shown in the official map of the district. We now followed a direction slightly west of south, until on the third

day camp was pitched on the Nzoia river, near a series of rapids about 20 miles from where the river enters the Kavirondo country. The Nzoia was forded at a small rapid where the water was knee-deep, and in places so fast-flowing as to make foothold difficult. The bed of the stream here was 60 feet wide, though in more normal places, where the water is considerably deeper, its average width is little more than half this. We had now sunk to a level of 5650 feet—the lowest altitude we touched on the plateau, though a few miles to both north and south the ground rapidly rises to 6000 feet and over.

The following day we crossed the Kubkong, and camped at the base of a group of granite kopjes, of which Ildalat and Kekupe are the most prominent. The Kubkong is the most important of the Nzoia affluents within the confines of the Guas Ngishu, and drains an area about equal to that section of the Nzoia basin lying above my crossing of the previous day. Yet at the respective crossings the volume of water in the Kubkong was approximately only one-quarter that of the Nzoia; in fact, there appeared to be almost as much water in some of the head-streams of the former river quite close to the Elgeyo escarpment as at this point. The porous nature of the volcanic rock formation, which in the intervening plain lies close to the surface, must account for this depreciation in water-power, for the influence of evaporation in so short a distance with a mean fall of 43 feet in the mile would be inappreciable.

A single day, of which some hours were spent making notes of the surrounding country from the summit of Mount Kekupe, was spent at this camp, and the next evening we camped near Sirgoi. It took two days to discover my colleagues, who were enjoying repose in a hollow 5 miles to the north of Mount Sergoi, and then the return journey commenced.

The game on Guas Ngishu is very plentiful. Hartebeest, topi, zebra, ostrich, water-buck, reedbuck, kob, bushbuck, eland, giraffe, and rhinoceros in the lower country, while numerous elephants and an occasional buffalo confine themselves mainly to the fastnesses of the forest.

In point of altitude, though a very small proportion of Guas Ngishu is under 6000 feet, the basin of the Nzoia where the river quits the territory is about 400 feet below that standard. Extending thence along the eastern base of Elgon northwards there is but an insignificant rise. Passing eastwards from this line, and limited in the north by the Chipchangwane mountains, there is a general rise of 40 feet in the mile until within 15 miles of the Elgeyo escarpment, where the proportionate rise increases to from 100 feet in the south to 70 in the north, culminating in an altitude of about 8500 and 7500 feet respectively. Due east we find the Laikipia plateau falling away in an opposite direction from an altitude at the escarpment of about 7500 feet in the south and 6500 in the north, or about 1000 feet lower than Elgeyo all along the line. It would almost appear, therefore, that the great upheaval

which created the original plateau centuries before the subsidence of the intervening 50 miles, now occupied by the great Rift-valley, divided it, had its principal point of energy a few miles to the east of the south-eastern extremity of Guas Ngishu—probably where the Kamasia mountains now stand.

A plateau so high above the sea-level, where water flows so rapidly as to deprive the mosquito of his natural breeding conditions, and where there appears to be an almost total absence of that rank river-vegetation he loves so well, should be more than ordinarily healthy. It is true our visit was limited to a few weeks at the end of the dry season, but there is high ground in Africa where the mosquito is not to be found either in the dry or wet season. So too with fly-life generally, although the common fly was troublesome in parts of the Rift-valley, I saw none on the plateau.

Though many readings were taken for maximum and minimum and other temperatures, a single six weeks, commencing towards the end of January, can have but a comparative value. Until within a week of the first shower of the rainy season, when a considerable rise in temperature is to be expected, the maximum was extremely stable, varying only from 71° to 74° Fahr., while the mean minimum stood at 40°, though here the range was wider—37°·5 to 47°—and on one occasion, already alluded to, sinking to 5° or 6° below freezing-point. Here, however, the local conditions were to some extent exceptional, as is shown by the fact that, although Herr Kaiser, who was 9 miles to the south-west, and at an altitude only 500 feet lower, did not read for minimum that night, he registered 3° Centigrade = 37°·4 Fahr. at 7 a.m., whereas at the same time my thermometer stood at 30° Fahr. Comparing these results with monthly averages taken throughout the year on other high ground near the equator, where the monthly variation is not so extreme as in the more northern and southern tropics, we would expect the mean-maximum to vary from 68° or 70° in the colder months to approximately 75° in the hottest month, and the minimum from 37° to 45° respectively, with occasional extremes to 100° and some half-dozen degrees below freezing-point. Thus there is nothing in the temperature of Guas Ngishu to prejudice its colonization prospects.

Turning to the ultimate material prospects of this district, and, in fact, of East Africa and Uganda as a whole, I admit that it is my firm belief that these protectorates are destined to hold a high position among the future states of our African empire. Not only do I hold them to be "white man's countries," but I believe the higher altitudes will earn a great reputation among the admittedly healthy countries of the world, and that they have a considerable agricultural and pastoral future. I may be too sanguine, but I do not think so. At least, I console myself with the reflection that very little good was ever done in this world without the stimulus of optimism—not to say idealism

In the interests of all our young African colonies, may we venture to hope that their administration will be carried on in a spirit of optimism. Pessimism and *laissez faire* spell stagnation; though optimism may not attain its ideal, it will at least leave no stones unturned. The history of the empire is replete with instances in support of this contention, and in Egypt and Rhodesia, Africa itself has within the last fifteen years supplied two remarkable instances of what can be achieved by administrators who take the most liberal view of possibilities. To consider what these countries have been, what they are to-day, and what, in the ordinary sequence of events, they promise to be to-morrow, is but to realize in its full import the distinction between the productive capacity and the economic prospects of a country. The one reminds us of nature pure and simple, the other of nature tempered with industrial and administrative effort.

The territory under discussion comprises some 6000 miles, of which about 400 are covered with a great entangled forest largely composed of podocarpus and juniper. Experts have examined similar forest land lying to the south of the plateau, and have pronounced favourably on a fair proportion of the wood obtainable. Perhaps the tree which most attracts the passing traveller is a giant cedar, which in a long straight trunk towers to a height of about 100 feet. For a rapidly growing local market these forests should afford scope to private enterprise, and at a future period they will, no doubt, supply a profitable export trade, if not to Europe, at least to South Africa, which is extraordinarily deficient in useful timbers. Obviously before this great asset can be exploited on a large scale, not only must branch lines be laid to the bases of operation, but arrangements for very special rates of transit must be made with the controllers of the Uganda railway. Sea-freights, though higher in the East Coast trade than the interests of such an industry would demand, will come down automatically as the volume of trade in general increases, for at sea there is existing competition, which already shows sign of further development as a result of a growing impression that East Africa has a useful future.

Of the rest of the plateau, about one-third is mountainous, and the remainder composed of downs open and undulating or covered with savannah, principally acacia. The soil is chiefly of that red ferruginous clay common to many parts of British East Africa, Uganda, and Central Africa, from the Congo-Zambezi watershed northwards. In the higher altitudes this soil attains a great depth, as may be seen where watercourses have cut a deep bed for themselves. On the whole it grows a good pasture, which ultimately would materially improve with the introduction of cattle to graze it down. For agricultural purposes, this soil is excellent in lowlying land or valleys where it has a chance of absorbing moisture; but, generally speaking, where

this red laterite occurs on Guas Ngishu, the undulations are so steep as to drain rain-water too rapidly over the surface to allow of much penetration. In places where the country is flatter, a yellowish clay is found. This is not so good for agricultural purposes, but grows a fair pasture, though, as a rule, where it occurs the porous lava-bed is so near the surface that towards the close of the dry season the veldt presents a very parched appearance. On the whole, I should say the plateau is unquestionably capable of carrying as much cattle as any other like area in Africa. That grazing stock will thrive, I considered to a great extent proved by the very prime condition of cattle and donkeys at the end of the dry season on a farm provisionally occupied by the three Africander farmers previously mentioned. I was just in time to see these beasts, which were shortly afterwards stolen and driven into the neighbouring forest by a gang of Nandi thieves. Generally speaking, sheep and goats would not do well here, though there are a few districts, principally in the west and north, where they should thrive. Wild ostriches are found on the Sirgoi flats, so presumably the domestic bird might be kept with advantage. Agriculture, except in small selected districts, is not likely to play more than a very subsidiary part in the future development of Guas Ngishu. Farmers will, no doubt, supply their own needs in cereals and vegetables, but will devote themselves mainly to the raising of stock. Almost any fruit grown in England should do well, though shelter from occasional high winds would be a necessity; but since eucalyptus, black wattle, and other trees have an abnormal growth—as much as 10 feet in a year—in the highlands of the protectorate, this shelter could be provided, and would in itself return a good profit in a country where its geological structure precludes the probability of the existence of coal deposits. Plants susceptible to the influence of night frosts are out of the question, except, perhaps, to the north of Mount Kisimachanga, where the ground slopes down to an altitude of about 4000 feet. I was unable to get so far myself, so cannot give an opinion on that point.

It is probable, then, that the industrial future of Guas Ngishu will in the main be the direct and indirect outcome of the forest—indigenous and planted—and of pasture; rough timber, and live cattle at first, and eventually, no doubt, the carpenter, the cabinetmaker, the tanner, the canner, and other craftsmen will supplement the population. Admittedly the two essential conditions to progress are the existence of markets at which to dispose of produce, and lines of communication to facilitate the carriage of goods to those markets. The so-called absence of markets, so often introduced both by governments and individuals as an excuse for neglecting opportunities, appears to me to be an exaggerated argument which should be banished from the mind of the would-be successful colonizer. By the time a colony has reached even

the early stage of development, of which East Africa is at present an example, a local market already exists capable of purchasing on good terms all that early industry can produce. My invariable experience has been that, in young colonies, to buy such "luxuries" as vegetables, fruit, eggs, or fresh butter, one has to pay such a price as would cause the English housekeeper to open her eyes, and that such staple articles as wheat have a trebled value. And all this time inferior substitutes are being imported. In the mean time, scores of men roam about the country, trading with natives, shooting, or looking for gold or precious stones, and, in fact, doing everything but attempting to develop the land surface, which is a finer asset than all the undiscovered goldfields in the world, for in agriculture and pasturage there lie the means to establish and support a large, distributed, and increasing settled population. As this grows, so does the local market. As the local market grows, fresh settlers pour in; the development of industry expands; surplus production is no longer a negligible quantity; the railways, in their own interests, lower their rates and open branch lines as the volume of trade increases; shipping companies compete with one another for a carrying trade now worth catering for; and thus step by step the conditions now existing in East Africa are substituted for those applicable to the Western States of America and some of our own older and more distant colonies, which can place wheat and other produce on the home market at prices not quite convenient to the home producer.

It is instructive to compare the trade-routes to England from the Western States and up-country East Africa respectively. In the former case, produce is carted to the nearest railway station, sometimes many miles away; it travels some 3000 miles by rail to an eastern port, is shipped, and a further 3000 miles sees it in a British port. East Africa produce will, on an average, travel one-eighth the distance by rail and three times as far by sea. Taking the relative cost throughout the world of land to sea transport, and all other conditions having by the process of competition become equal, the balance lies distinctly in favour of East Africa, and it must be remembered that, in spite of certain drawbacks, the tropics are much more productive than the temperate zones.

But there is another proposition which struck me forcibly when I passed down the Nile from Uganda to Egypt five years ago. That great river is the natural outlet for Uganda and north-western British East Africa, and, with engineering enterprise and expense quite trivial as compared with what has already been done in Egypt, can be made navigable from Lake Albert to Upper Egypt. Indirectly and directly, Sir William Garstin's great scheme for the canalization of the Nile from Bor to Fashoda should do much for these protectorates. Firstly, it will save the millions of gallons of water continually evaporating in

the sudd expanse, and thus swell the river to such an extent as will probably give to the lower Nile an increased volume even after the demands of irrigation have been met. This may suggest to the Egyptian Government the economic advantages of a navigable waterway through the cataract district to the Mediterranean. Secondly, this great work will so vastly widen the area of cultivation as to re-establish Egypt as one of the world's great granaries. With the establishment of this new era, Mediterranean sea-freights will become proportionate to those on the Atlantic, and Uganda will share the advantage with Upper Egypt—for a journey a few days longer in a Nile barge will not materially add to expense in transit.

Before the reading of the paper, the PRESIDENT said: The Fellows will, I am sure, welcome the presence on this platform of Major Gibbons, who has given us more than one valuable address. The last occasion, if my memory serves me right, was some five years ago, when Major Gibbons placed before us the geographical results of his extensive explorations in Barotseland. You may remember that he received high encomiums both from our recent President, Sir Clements Markham, and from other Fellows of the Society, in respect of the thoroughness of his work. It was, therefore, no surprise to us to learn two or three years later that he had been selected as the most suitable available person, unconnected with and independent of the administration of East Africa, to go to the Guas Ngishu plateau and report upon its prospects as an outlet for the Zionist movement, or perhaps I should now say, the Jewish Territorial Organization. The general principles underlying that movement probably command the sympathies of most thinking persons in our liberty-loving land, although, naturally, there is considerable division amongst us, just as there is amongst the Zionists themselves, as to the particular direction which their energy should take. I have referred to this subject because it is a question of the moment, so that it lends a special and immediate interest to the paper of the evening, apart from the general interest which the Royal Geographical Society must always take in the development of an unsettled region, and especially if that region falls within the circle of the British Empire. And if any one should feel inclined to suggest that the particular subject to which I have referred does not come strictly within the purview of geography, I would plead that geographical science, which has borrowed so much from, and has lent so much to, various other departments of human knowledge, cannot afford to dissociate itself from sociological or ethnological questions, or indeed from any questions which relate, even remotely, to the reactions between mankind and the elements and forces of its environment. I now invite Major Gibbons to read his paper.

After the paper, the PRESIDENT said: We are so fortunate as to have with us to-night perhaps the highest authority on general questions connected with East Africa. I refer to Sir Charles Eliot. I know that he has pledged himself to deliver an address elsewhere on this subject to-morrow night, and it would not be fair to ask him to encroach too much on what he is then going to say; but I have no doubt he will be able to give us a few interesting observations out of the wealth of his knowledge of the country in question.

Sir CHARLES ELIOT: I have listened with great pleasure to the very interesting paper which Major Gibbons has read. I know something of the part of Africa with which he has dealt. I have made two journeys in it myself, one

from Mumias on the Uganda side, and another from the Sirgoit rock on the east to Nandi Boma, and then down to the plains which in part cover his route, and I can quite endorse all that he said about the beauty of the country. The view over the Kerio valley of which he spoke is one of the most striking, as far as my experience goes, in the world. I could not quite understand from his account whether I saw it from the same point he did, but the distance cannot have been great. When near the Sirgoit rock, we were told that there was a fine view to the east, and I went from the plains through a forest, with some uncertainty as to the road. We wandered about in this forest for about two hours, wondering when we should get out. The foliage was so thick that we seemed to be in twilight all the time, and all of a sudden, just as we were giving up hope, we came through a sort of gateway on to a ledge of grass looking over a valley about 3000 feet deep, and something between 20 and 30 miles wide. The bottom of it was spread out like a map, in which one saw the Kerio river taking its way to a lake. The sides of it were partly carved into the most fantastic spires and domes like those of a Gothic cathedral, and partly spread out in grassy ledges on which there were native villages, and I should doubt if in any part of the world one would find such an extraordinarily wide view with so striking a combination of green vegetation and grey rock and waterfalls springing out of the rock.

As for this plateau itself, it is a very curious place; it seems to have all the qualities which should ensure inhabitants, and yet it is at present absolutely uninhabited. Major Gibbons alluded to the obscurity of the history. So far as we can make out, it has been occupied within fairly recent times, that is to say, within a hundred years, for one cannot get any dates out of native memories in East Africa. But in that time there have been two races, of one of which nothing is left except the remains of low-walled stone dwellings. Those people were apparently not Masai, and they must have been a very unusual race in East Africa, for builders in stone there are extremely rare. I know of none except on the Guas Ngishu, and some tribes on the banks of the Nile who use stone for the lower part of their huts, though not for the superstructure. These people were, according to native traditions, driven out by the Masai. The Masai of the plateau, who probably came from the north, involved themselves in a battle with another branch of the Masai who lived to the south, and got the worst of it; and while they were engaged in this conflict, the Nandi destroyed all that remained of them on the plateau. From that time it has been uninhabited, since the Nandi preferred forest land, and the Masai, who preferred open country, had been exterminated.

I was very glad indeed to hear that Major Gibbons had formed such a high idea of the capabilities of the Guas Ngishu plateau, because I must say that I myself never thought it was one of the best parts of East Africa. And if he thinks so well of what I should have said was a somewhat distant part not presenting the greatest advantages, it augurs well for the verdict which will be passed by travellers on the whole of the country. I entirely endorse what he says as to the importance of the highlands of the East Africa protectorate. It is a regrettable thing that so little attention has been paid to them in the past, and I hope that in the future the very great possibilities which they possess for European colonization will be recognized. It is not only a country where Europeans can live comfortably, but it is a singularly beautiful and attractive country. Of the many people who have visited it, I do not think any one has brought back any other impression; and the most recent statistics that have been published seem to indicate that it is progressing favourably, commercially and economically, and I trust that it will in a few years prove to be, not only one of the most important parts of Africa, but also a very important part of the British Empire.

Colonel W. H. BROUN: I have not been on the plateau; I have only seen it at a distance from the railway going up. It is certainly a very beautiful-looking country, and the photographs I have seen resemble other parts of the protectorate, and they remind one very much of Scotch moor or Cumberland fell. It is a very fine land, and I have no doubt that it will be a country in which cattle will thrive extremely well; but at present a good deal of what is going on will not, I think, prove to be beneficial to the country.

The PRESIDENT: The hour is now so advanced that I think we must propose and carry our usual vote of thanks to the lecturer.

RECENT ANTARCTIC EXPEDITIONS: THEIR RESULTS.

By Dr. G. Von NEUMAYER.

AT the seventy-seventh meeting in Meran of the Society of German Scientists and Physicians, a paper was, on September 26 last, read by Dr. von Neumayer on the results of south polar expeditions during the last eight years. Recapitulating the results of recent Antarctic expeditions, Dr. von Neumayer emphasized the recent English expedition. Between them Captain Scott and Captain Colbeck had laid down the lines on which all future Antarctic expeditions must proceed. To them geography owed the establishment of the method of geographical exploration in extreme southern latitudes. The enormous distances covered by Captain Scott and his bold fellow-adventurers dated a new departure in the history of Antarctic discovery. Not only had the conception of the physical features of these regions been rectified and widened, not to say, revolutionized; the ice-wall, hitherto viewed as an insuperable barrier to further advance, had been overcome and rich spoils secured. Leaving winter quarters, November, 1903, Captain Scott climbed the glacier valleys up to a height of over 9000 feet above sea-level, and to a distance of 300 miles from the station. In a latitude of 77° 59′ S., the adventurers in sledges penetrated to as far as 146° 33′ E., on the south side, namely, of the hitherto accredited site of the Earth's magnetic pole. They must, therefore, have crossed the isogonic line where the north end of the needle pointed to the geodetic terrestrial pole. This was an accomplishment of highest value in the cause of terrestrial magnetic research, and science might well with strained expectation await the communication of the values thence obtained. Equally interesting was the determination that under lat. 84° S. a mountain rose to a height of 15,000 feet, Erebus and Terror having hitherto ranked as the highest heights of the Antarctic Regions. To that mountain was given the name of the indefatigable promoter of south polar research, Mount Markham. Another discovery of much promise was that under lat. 80° S. Scott's expedition found remains of fossil plants—a discovery likely to be of great consequence in its bearing on the Earth's climatic changes. Thus was the vast domain

stretching south of the polar circle, from 160° E. to 160° W., all at once made known to us in various aspects to an extent exceeding the fondest expectations. Of much importance for future exploration was also Captain Colbeck's determination that the pack ice must be worked through early in summer in order to reach open water. This should settle once for all, as a general rule, *mutatis mutandis*, the season of the year suitable for such expeditions. In respect of the clearness and transparency of the weather, Lieut. Royds gave interesting, if not completely new, communications. His observation how day after day they had glorious sunshine day and night was worthy of special attention.

Passing next to the expedition in the Weddell region, Dr. von Neumayer pointed out how the Belgian expedition, the first to winter within the Arctic zone, was also the first to report the winter temperatures in high southern latitudes. The extensive oceanographic surveys and topographic measurements carried out by Lieut. Lecointe during the voyage in the archipelago south of South America, and more particularly in the icefield, made the Belgian one of the most interesting and valuable expeditions ever conducted in the Antarctic. The numerous drawings made, embodied in comprehensive maps, were of great service in the way of threading the medley of straits, bays, and islands, while the passage in the icefield to Alexander I. and Peter I. islands would always be prized as a memorable event, yielding a rich booty of experiences as to ice in the Antarctic. The numerous and excellently executed maps issued by the Belgian expedition attest how well the staff accomplished its geographic mission. As to the physical department of its labours, the short monographs, those by Dr. Arçtowski, *e.g.*, justify us in expecting contributions to science of radical value, when once the results of this expedition have been given in full to the world. The region south of Cape Horn and beyond lat. 60° S., already worked by Ross, D'Urville, Bransfield, Biscoe, and recently by Larsen, Hovgaard, and Dalmann, was by the Belgian expedition afresh explored. Though, no doubt, many corrections, topographic and geographic, would yet be made, nothing essentially new respecting the configuration of the archipelago still awaited discovery.

The meritorious expedition of Dr. Charcot with the *Français* effected rectifications here and there, while its wintering on the Wandel island in the neighbourhood of Biscoe islands yielded some new climatic data. It was, withal, very remarkable that during his stay there Dr. Charcot could make no observation of the aurora Australis any more than did the Belgian expedition.

The course of the Belgian expedition, modestly equipped as it was, was on the whole fortunate, though it cost the life of so accomplished and promising a savant as Lieut. Danco. On the most varied fields of science it gathered in important fruits, as substantiated by the highly

valuable publications it had already issued. From the Belgian school, again, proceeded such tried and able men as Roald Amundsen, who now in the northern ice was penetrating to the Earth's magnetic pole.

In the Weddell quadrant (to quote Markham) the Swedish expedition under Dr. Nordenskjöld had reaped a brilliant harvest. The intrepid explorer had discovered and determined in the Western Antarctic King Oscar Land. Passing two winters, with Snow hill near Seymour island (64° 22'·5 S. and 57° 9' W.) as a centre, the expedition succeeded in maintaining communication with the civilized world by means of the ship *Antarctic*. Captain Larsen, well-known expert in ice voyages, made successful runs between the Swedish winter station and the Falkland islands, but yet lost his ship in the ice at Paulet island (63° 35' S. and 55° 52' W.), where in 1903 the shipwrecked wintered, making valuable observations respecting weather and ice. Attempting to penetrate further south towards the middle of the Weddell sea, the *Antarctic* made a large collection of hydrographic and oceanographic measurements. The soundings in this region, taken in conjunction with those carried out by Bruce, were of very notable value by way of completing the knowledge of the relief of the floor. In a number of sledge journeys, Nordenskjöld and his fellow-explorers fixed the position of Graham Land and Oscar Land. The winter season was turned to best account in instituting meteorological, magnetic, and other geophysical observations and surveys. Dr. G. Andersson, who in the Falkland islands had been making geographical and physical observations, as also geological investigations on the west coast, induced Captain Larsen to visit the island of St. Georgia. To Dr. Andersson's studies we accordingly owed an enlargement of our knowledge of this lonely island in the South Atlantic ocean, examining as he did the state of the German observatory set up there 1882–83 : he found them greatly damaged by wind. From St. Georgia the passage was made to Graham Land and Nordenskjöld's station. Happily, before the shipwreck at Paulet island, Andersson and his two companions disembarked, pushing their way on to Snow hill with sledges and snowshoes. This memorable journey yielded valuable surveys and observations. In Louis Philippe Land the travellers made an extremely estimable supplement to Nordenskjöld's labours in Snow hill, and Larsen's in Paulet island. By reason of the distances separating the investigators, the data they collected were especially instructive meteorologically.

Once the very comprehensive materials were sifted and reproduced in maps, the discovery of Crown Prince Gustav channel and its topographic relation to Gerlache strait and Danco Land, taken in connection with the explorations of the Belgian expedition, Dr. Charcot's expedition and his wintering in Wandel Island, would prove quite an epoch in geography.

The Scottish National Expedition, penetrating to 72° S. and 17°

W., and mapping 150 miles of the coast of the discovered Coats land, had not only done good service by penetrating the Weddell sea and instituting a valuable series of soundings, but had enriched science by establishing an altogether different representation of the floor-relief of that sea. Attaching itself on one hand to the labours of the German ship *Valdivia*, and on the other to the labours of the Swedish expedition, the Scottish expedition furnished important fixed points towards a general conception of South sea soundings. It was gathered that a submarine ridge extended in the form of a curve from Madagascar to Bouvet islands, and from Bouvet islands to the Sandwich group. Thence, in Bruce's opinion, there was a fork-like connection, on one hand, through the South Orkney islands with Graham Land, and on the other, through South Georgia with the Falkland islands and the South American continent. Thus Bruce's oceanic labours tended to effect an essential transformation in our views of the floor-relief of the South Atlantic and South Indian ocean. The 6000 fathoms' depth of water sounded by Ross in 68° 32′ S. and 12° 49′ W. were, by the thorough experiments of the *Scotia*, cancelled—a fact carrying with it a complete recast of our views of the Weddell sea. Of no small service, moreover, to science was it that the physical station in Scotia bay (60° 44′ S. and 44° 50′ W.) was to be maintained in permanence. The interesting map accompanying Bruce's publications included the coast claiming to have been found by Morrell, and the existence of which had been much called in question. The achievements of the Scottish National Antarctic Expedition were also attained at a small expense of means. By its investigations, and those of Gerlache, Charcot, and Nordenskjöld, supplemented by the further observations of the Copland observatory, a foundation had been laid for determining the meteorology of the Weddell sea region.

In the Enderby region south of Kerguelen was the field of the German Antarctic Expedition under von Drygalski, in the ship *Gauss*. Its activity was essentially limited to the east of the region, in the neighbourhood of the south polar circle, where Wilkes's expedition ended, and Termination Land was mapped. Since in 1874 the English *Challenger* had crossed the polar circle at 80° E., nothing had been attempted in that region, except what was done in 1899 by the German ship *Valdivia*, of the Deep Sea Expedition. The existence of Termination Land was rendered more than doubtful by the investigations of the *Challenger*, and was, by the German expedition, proved to be on the side of Wilkes illusionary, while on the other side of the quadrant Enderby Land, nearly connected, if not identical, with Kemp Land, may be considered as tolerably well ascertained, and to be rightly laid down in the maps under the south polar circle. Having in the autumn of 1901 erected a station on the Kerguelen islands as basis for observations in the high south, *Gauss*, on January 31, 1902, left Kerguelen and reached,

without crossing, the polar circle at 90° E., where the ship was frozen in. At a distance of 100 kilometres therefrom was found firm land, to which was given the name of Kaiser Wilhelm II. land. A mountain there, rising inside the polar circle to a height of 1220 feet, was named Gaussberg. Surrounded by ice and snow, an observatory was erected for geographical and magnetical observations. Sledge journeys of limited range were carried out. Magnetic, meteorologic, and geodetic observations were diligently gathered in. The structure and movement of ice were especially studied. Biological, geological, and botanical work was zealously pursued. At length on February 8 there was promise of relaxation of ice, and the machine was set in motion for freeing the ship of its gelid chains. In spite, however, of every effort, the ship was eventually borne by the current and the ice in a northerly direction. By the end of March, 1903, all hope of southerly sailing had to be abandoned. On April 12 the ship, in 59° 30′ S. and 71° E., sighted the last iceberg. Thereafter it made for the south African coast, whence was sent the first intelligence of the course of the expedition. To break ground is the great problem of the exploration of the Enderby region, where indisputably Wilkes did see firm land, on which, however, it was impossible for him to set foot any more than it was possible for him to penetrate further south or west, where, too, the *Challenger* was unable to press further east; and where, moreover, according to Fricker's investigations into the ice of the south polar zone, different ice-currents met, accumulating enormous ice-heaps.* Such task experts deprecated the German expedition from attempting to penetrate towards the south pole, especially at so advanced season of the year. It was therefore proposed by the president of the German South Polar Commission, to attack the Enderby region from the basis of the Kemp-Enderby Land. Thence, in all circumstances, the ship could cross the south polar circle, and ascertain the nature of the land-masses in that quarter, whether islands, according to Morrell, or the northern outspurs of a continent. It is far from me to assume the part of critic; it is enough to demonstrate how the problem of the Antarctic Regions south of Kerguelen has been left unsolved.

In conclusion, may I cast a glance at the problems still awaiting

* Fricker in 'Antarctis' (Berlin, 1898), pp. 171, 172; and in 'Ursprung u. Verbreitung des Antarctischen Treibeises' (Leipzig, 1892), p. 106. "The second reference that the *Challenger* observed a current making straight to Heard island might be read in the fact that the southern branch, gradually taking a more easterly course at about 62° to 65° S. and 95° to 100° E., encountered the approximately parallel current making west and north-west for Wilkes Land, thus producing a block. This would account for the collection of masses of pack-ice which here, almost at the very same spot, kept back Cook, Wilkes, Moore, and Nares from proceeding further south, west, or east." In their several reports are testimonies to this effect. Bellingshausen, too, at 85° E., had, on account of the ice, to give up hope of making eastwards or southwards, and was obliged to steer his course to Sydney.

solution? I would here lay emphasis on the fact that the exploration of the Enderby region, with basis of a station to be erected on Kemp-Enderby Land, must be taken in hand at an opportune season of the year. Thereby is not meant that the passage should be made by steering from west to east, but, if possible, from the west of Enderby region southwards (see Neumayer, 'Auf zum Südpol!' pp. 347–351). Whether it were possible (see *Challenger* 'Report of the Scientific Results of the Voyage of H.M.S. *Challenger* during 1873–6,' Narrative, vol. 1, part i. pp. 407, 408 and ff.) to thence attain a high southern latitude may be conjectured, but it were arrogance to make a definite assertion. Probably the southern continent, on which, too, the German expedition was at work, stretches further to the west than was originally assumed. Above all, it would be of service, proceeding from the west, to define towards south the boundaries of the continent.

Another region of the Antarctic, as good as wholly unknown, stretches from the meridian of Edward VII. Land, *i.e.* 150° to 105° W., to the domain named where the Belgian expedition reaped its brilliant results. Here are no fixed points to serve as a basis for further exploration. Cook and Biscoe here successfully sailed long stretches from east to west, while Bellingshausen sailed from 65° S. and 160° E. eastwards to Peter I. and Alexander I. islands, discovered by him. Cook and Biscoe, in their time, made important observations on the ice and the weather, but announced thence no trace of land. Here exploration might be most appropriately pursued on King Edward VII. Land, and an attempt might be made to follow the course of the coast further to the east, an attempt which, at a favourable season and with a strong steamer, might have some promise of success in it. If in the summer season of the southern hemisphere the winds should be taken as determinative, it might yet be possible, according to earlier experiences, to proceed from east about the basis of Biscoe island to the west. In our time, however, when steam-power is available, there are other things than the direction of the winds to be taken into account for such exploration. The importance of geographic exploration in so extensive a field of the Antarctic cannot be too highly rated, and its exploration is, especially in a geographical respect, a desideratum of the very first rank.

Much in want of investigation is also the region south of Bouvet islands, namely, between Enderby and Coats land, a region the investigation of which could be most suitably connected with the Kemp-Enderby group of lands. Here is a highly interesting problem to solve, and a very sensible gap within the Antarctic circle to fill up.

Not to attempt anything like an exhaustive enumeration of the problems still awaiting solution in the Antarctic, let me urge the prosecution of exploration in the spirit which has animated the expeditions just closed, and so we may hope to see lifted more and more

the veil over the great southern land. Apart from the great problems of meteorology and magnetism, the discovery by the British expedition of fossil remains (dicotyledons?) in the highest southern latitudes, as already discovered in high northern, opens the prospect of a solution of the question of climatic changes—a solution which might, perhaps, be found on the basis of an answer to the "Equatorial problem in palæontology."

Besides their service of geography, all the expeditions enumerated have devoted marked attention to the geophysical sciences. On the occasion of the German Geographical Congress at Danzig, we were fortified with a view of the compass of geophysical observations comprehended in the scope of the work of the German South Polar Expedition, and it was impossible not to admire the zeal and conscientiousness with which their scientific plan of research was carried out. But, indeed, in all the expeditions, all branches of geophysics, meteorology, terrestrial magnetism, seismology, and geodesy were worked with equal zeal and insight. The scientific world may, therefore, well await with strained expectancy the publication of the complete results of the expeditions, and all the more that, in consequence of international adjustments of work, a complete unity of results may be relied on.

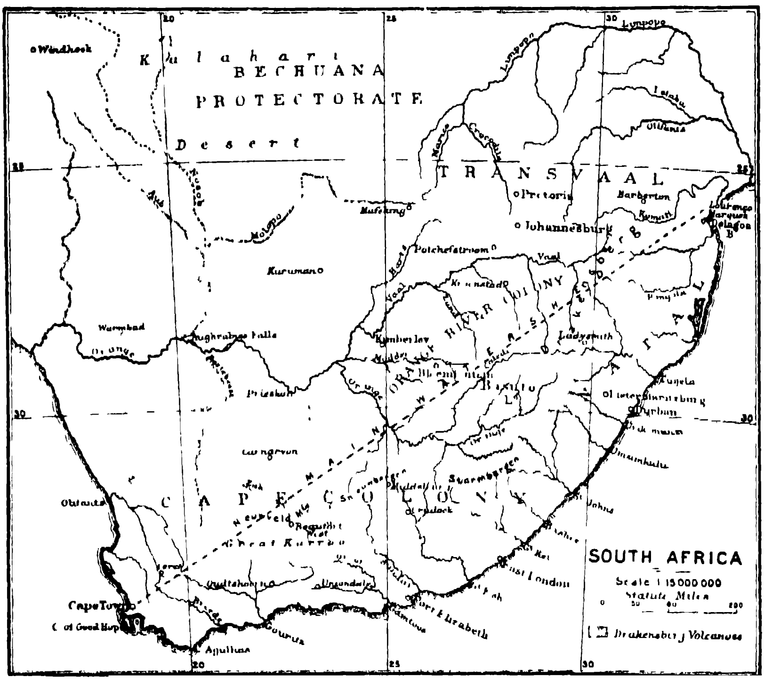
THE RIVERS OF CAPE COLONY.

By Prof. ERNEST H. L. SCHWARZ, Rhodes University College, Grahamstown.

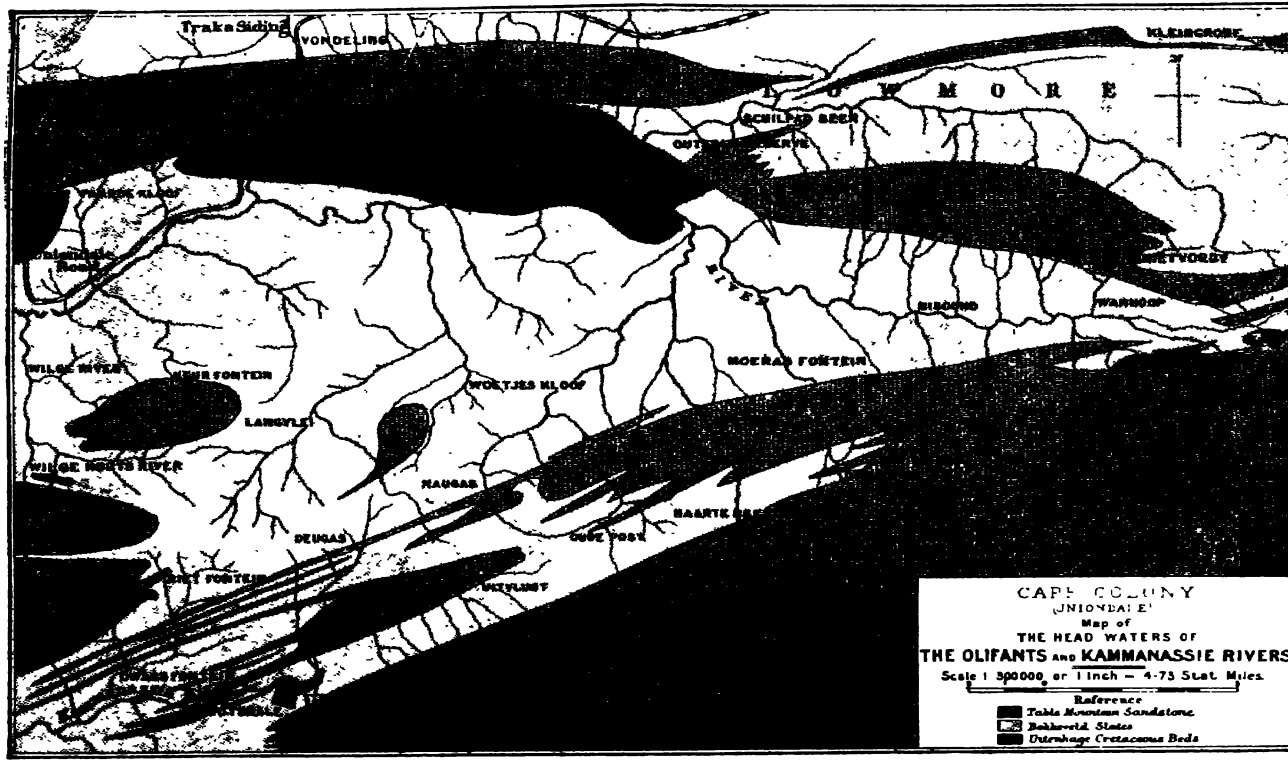
The number of books and papers dealing with the geology of South Africa has become so great that a layman would suppose that we geologists must have a very good idea of our country. This is not the case, for the literature is mostly about details which have as yet no place in a general whole, and the fact that most of what is published appears in the form of Blue-books has raised a tendency to decry generalizations. For this reason very little has been written on the river-system of South Africa, because, to begin with, one must reconstruct the sub-continent and trace its condition when the rivers first began to flow. We have, therefore, no well-studied basis on which to build our arguments, and the arrangement of the land surfaces at the time of the installation of our river system which I shall adopt in the present paper must be understood to be an attempt to group facts as they have presented themselves to me, and not a statement of facts about which there is any body of consensus to appeal to.

If we draw a straight line from Cape Town to near Delagoa bay, we shall find that to the northwards of it there is a regular succession of river-channels originating from it, and to the southwards of it there is exactly the same condition of things, except in the area occupied by

Basutoland, where there is a displacement. The existence of a perfectly straight watershed is almost literally true, for the encroachments on either side are very slight. If we look more closely at the Basutoland area, we shall find that the Drakensberg mountains form a secondary watershed, from which, on the south, the rivers flow as from the main watershed, but to the north the rivers flow parallel to the main and secondary watersheds for some distance, and then join together as the Orange river and flow across the main watershed. This break in the line is the only one which occurs between Cape Town and Delagoa Bay.



I cannot conceive of any explanation for such an arrangement, except that which assumes that there was a vast plain stretching over the whole land when the sub-continent first rose from the water's edge, and that the central ridge was already then formed. If we examine the central parting of the waters, we find that there is no structural cause for its existence; there is no backbone of igneous rock, nor is there a chain of folded mountains to account for it; neither, again, is there a wide anticlinal arch, for the beds dip in towards it. I have adduced reasons elsewhere for supposing that the watershed owes its origin to the manner in which the Karroo sediments were laid down: they were accumulated on the thickest deposits about 150 miles from



CAPE COLONY
UNIONDALE
Map of
THE HEAD WATERS OF
THE OLIFANTS AND KAMMANASSIE RIVERS
Scale 1 300000 or 1 Inch — 4·73 Stat. Miles
Reference
Table Mountain Sandstone
Bokkeveld Slates
Uitenhage Cretaceous Beds
Traka Siding
VONDELING
KLEINGROBE
SCHILPAD BEEN
RIVER
MOERAS FONTEIN
WOLTJES KLOOF
LANGVLEI
WILGE RIVER
WILGE HOUTS RIVER
HAUGAS
DEUGAS
OUDE POST
UNTVLUGT
WARMHOF

the old Permian shore-line, which ran north-eastwards to the north of the watershed. When elevation began, the curvature of the basin in which they were lying was reduced, and consequently the thickest deposits formed an elevation, which at once became a water-parting.

This original plain was about on a level with the main watershed as it exists to-day, for I have seen evidence elsewhere of the extremely little erosion that takes place on a flat water-parting, and roughly we can say it is so now at an elevation of 6000 feet above sea-level. Little isolated patches of flat ground along the watershed still testify to the existence of this peneplain, beginning with the Nieuwveld mountains on the west, and followed by the Snieuwbergen and the high country round Middelburg and Steynsburg. From here the country above the 6000-feet level takes a bend round the secondary watershed through the Stormbergen and Drakensberg mountains; the main watershed in the Orange River Colony never rises to the 6000-feet level. On the north, the Witwatersrand shows evidence of having once been connected with the peneplain, although it fails to rise to the 6000-feet level by some 300 or 400 feet. On the south, the sharp crests of many of the folded mountain ranges cut an almost level sky-line at elevations from 4500 feet to 5500 feet, and I am now inclined to regard them as having also participated in the formation of the peneplain.

At one time I held that the mountains had been folded subsequently to the rivers, and that they had risen, and were rising, gradually across the channels of the rivers; whereas my colleague, Mr. Rogers, held that they began to flow when their tops were still buried. Our conception of the plain-formation in South Africa has been of very slow growth, and for many years we had only the coastal plain, elevated 600 feet above sea-level, to guide us. It was only recently that, working on the watershed between the Souritz and Samtoos rivers, we obtained evidence of a widely spread plain elevated 4000 feet above sea-level, and therefore the additional 2000 feet—to bring the whole country under a peneplain—became no very great mental effort to conceive.

Originally this 6000-feet peneplain was not interrupted in the Basutoland area; it was only subsequent to the surface being laid dry that a great range of volcanoes was developed, and the vast accumulations of tuff and outpourings of lava, which now make up the Drakensberg mountains, were thrown across the river-channels, dammed back the water, and forced it to flow across the main watershed.

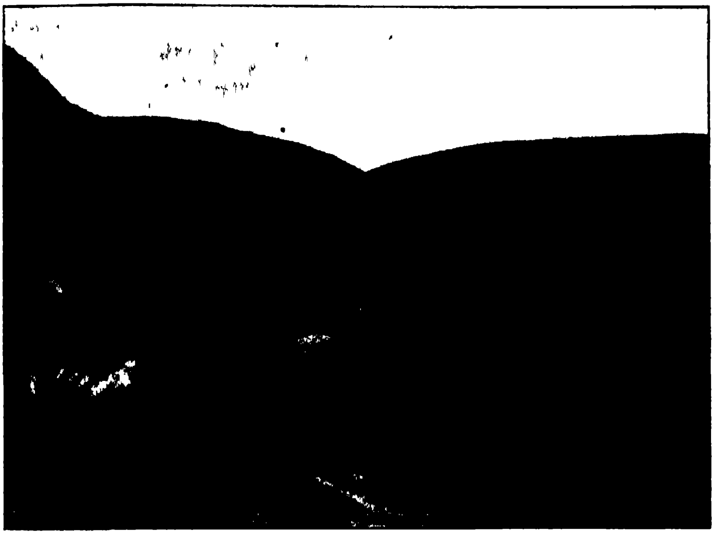
Here, however, there is matter for controversy. The lavas of the Drakensberg lie on a deposit called the Cave Sandstone. Is this latter an ordinary sediment, or is it a tuff poured out like the incandescent mud from the Soufrière in St. Vincent? Primarily the Cave Sandstone is made up of grains of quartz, with large quantities of felspar and other detritus from granite and crystalline schists. Underlying the Cave Sandstone and the transitional "Red Beds," there are the Molteno Beds,


CAPE COLONY
(CERES DISTRICT)
Map of
THE COLD BOKKEVELD
Scale 1 450 000 or 1 Inch = 7.1 Miles
Reference
Table Mountain Sandstone
Bokkeveld Slates
Witteberg Quartzites
Droyka Conglomerate
Elands Drift
COLD
BOKKEVELD
OnVERWAG
WAGENWAK
WARM BOKKEVELD

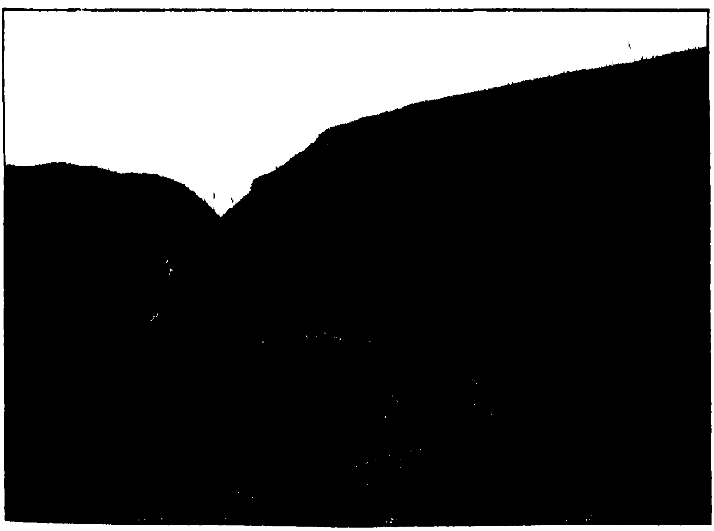
made up of the same materials, and undoubtedly sedimentary. Why, then, take the Cave Sandstone to be other than sedimentary? In the first place, tuffs made of the same granitic detritus have been described elsewhere. Instead of the tuff being composed of material derived from the shattering of liquid lava, as in the Soufrière hot mud and ordinary tuffs, these granitic tuffs are derived from the explosions which caused the openings through which the lava was erupted later on, and thus consist of the shattered rocks which go to make up the walls of the pipe.

KEYHOLE GORGE, ZAND KRAAL, BAVIAAN'S KLOOF, WILLOWMORE.

Secondly, the quartz grains of the Cave Sandstone are eaten into on the surface, and minute shreds of some talcose mineral penetrate the grain from the outside, giving the rock as a whole a chalky look. This is an effect that can best be explained by the material once being saturated with heated vapour. In the Molteno Sandstone, on the other hand, the quartz grains have still the dirt of their transit adherent, and a large number of them have new crystalline deposits of silica on them, as in normal sandstones, causing the rock to glint and sparkle in the



A KEYHOLE GORGE, SEEN FROM THE OUTSIDE—THAT IS, FROM THE VALLEY ERODED IN LOOSE UITENHAGE BEDS, KLIPFONTEIN, BAVIAAN'S KLOOF.



BAVIAAN'S KLOOF RIVER RUNNING IN TABLE MOUNTAIN. SANDSTONE BETWEEN TWO BASINS OF UITENHAGE BEDS.

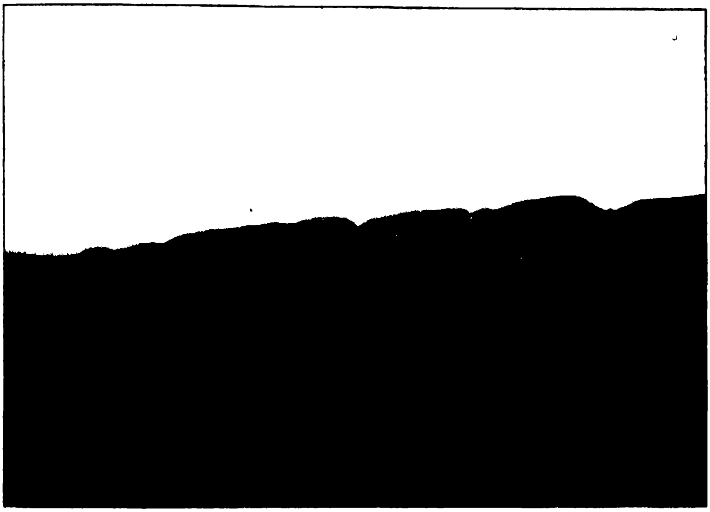
sunshine. But the most cogent reason for considering the Cave Sandstone to have been poured over the land as a liquid mud is the fact that it forms banks 800 feet thick, without a trace of bedding or alteration of material. Sometimes there is a bed of volcanic ash intercalated, or a lenticular patch of mud crowded with remains of phyllopods and cockroaches, grasshoppers, and other land insects. Again, there is sometimes a pseudo-bedding, where the rock, on weathering, shows partings convoluted in such a manner that it looks as if the whole had been stirred round in a gigantic pot; or the solid 800-feet bank is broken across by a plane running slantingly through the mass at an angle which looks like the angle of repose of the material. Lastly, the limit of thickness, namely 800 feet, is the same as that of the Italian peperino, which was undoubtedly poured over the land as a liquid mud, and 800 feet seems, therefore, to be the maximum self-sustaining column of such material.

The age of the original South African peneplain was late Jurassic, and it had already risen 2000 feet before the volcanoes broke out in early Cretaceous times, and on the plains cut along the coast at sea-level, the Uitenhage beds were being laid down. There were subsequently torsional earth-movements which faulted down the Uitenhage Cretaceous beds into small fold-basins, then elevation, and again a sinking to the same level, which is now 4000 feet above the sea.

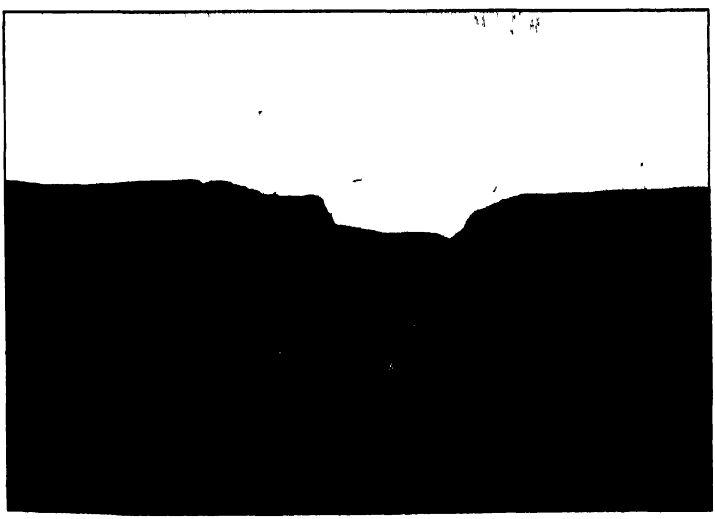
My reason for assuming that there is a 4000-feet peneplain belonging to two periods, before and after the deposition of the Uitenhage beds, rests on evidence I found in Baviaan's kloof. There there is a horizontal bed of Table mountain sandstone (Silurian), bent on the north downwards at an angle of 45°; resting on the dip-slope is a mass of Uitenhage beds inclined at the same angle, and cut off on top by a plain passing equally through the top of the horizontal Table mountain sandstone. How to interpret this evidence otherwise than by assuming two periods of base-levelling at about the same elevation I cannot conceive, but the two periods make it exceedingly difficult to grasp the details of the structure of the country.

The 4000-feet peneplain stretched over the greater part of the Cape Colony south of the main watershed, and at the time of its full development the rivers were very differently arranged from what they now are. As the land rose, however, the dominant trend of the rivers produced by the original 6000-feet peneplain began to assert itself more and more, and over the greater portion of the country little now remains to attest this earlier system. Even in the great displacement in Basutoland caused by the volcanoes, the coast streams are stealthily creeping inland, and will eventually capture the waters that now flow into the upper Orange river, and at some future date the original straight watershed will be restored in its entirety.

North of the main watershed there appears never to have been a



ZOETENDAT'S VLEY, WILLOWMORE. THE HILLS ARE CUT TO A LEVEL WITH THE 4000-FOOT PLATEAU, FORMERLY, THE STREAMS FLOWING FROM THEM ON THE NORTH RAN FAR OUT INTO THE KARROO, NOW THEY ARE COLLECTED BY A RIVER SHOWN BY THE ROW OF THORN TREES RUNNING ALONG THE BASE OF THE HILLS.

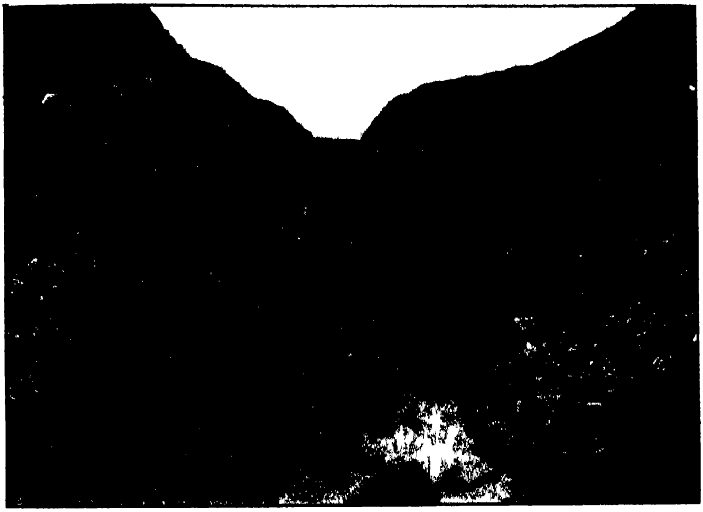


ENTRANCE TO MEIRING'S POORT; A RIVER STRIKING THE MOUNTAINS AT RIGHT ANGLES.

definite period of alteration of the river-system. The Orange river, carrying all the water from the north of the main watershed, is held up by a bar of granite at the Aughrabies falls, and the stages in the wearing away of the obstruction are represented by plateaux, or the remains of such, at various elevations on the north-west of the colony, and, I believe, in the Orange River Colony as well.

The most remarkable evidence of the river-system accommodating itself to the 4000-feet peneplain after being arranged for the 6000-feet level, is afforded by the Cold Bokkeveld. This tract of country lies north of Ceres, and consists of a narrow valley shut in with high mountains, the Cederbergen on the east, and the Cold Bokkeveld mountains on the west, the two running together on the north, and closing the valley in. On the south the valley widens out, and then closes in again; at the end there is an abrupt break, the Gydow pass, where there is a sudden descent to the Warm Bokkeveld, 1000 feet lower. Now, with a valley shut in by high mountains and open to the south, one would naturally expect that the rivers would course down the valley and out at the open end; but in reality the rivers take their origin at the edge of the precipice, run up the valley, and cut through the mountains at their greatest width. The explanation of this anomaly lies in the fact that the edge of the precipice—the Gydow pass—is part of the main watershed of the colony, and, faithful to the rule that, unless a volcano rises across the course of a river, no stream will violate this boundary, 2000 feet thickness of solid sediments have been carried out of this great valley without the waters being turned over the precipice into the Warm Bokkeveld, although a dam of only a moderate height at the north end of the valley would do so. This very remarkable example of a river being able to clear its course at a sufficient rate to allow for the sediments accumulating in its upper reaches to be carried away, is almost on the point of disappearing; there is evidently a very resistant bar at the mouth of the river that drains the valley, for the Cold Bokkeveld consists of flat marshy ground, whereas past the bar the river dashes down a series of cascades into the heart of the Cederbergen. If this bar does not give way in the next thousand years, the Cold Bokkeveld will drain south instead of north, unless a tributary of the Olifant's river, which has eaten back till it taps one corner of the Cold Bokkeveld, manages to secure the drainage for itself.

There is a phenomenon of a somewhat different kind exhibited in another Olifant's river—that which flows past Oudtshoorn into the Gouritz river. Both the Olifant's river and the Kammanassie river started level on the 4000-feet peneplain, each running west and draining equal areas; the Olifant's river, however, traversed the loosely aggregated deposits of Uitenage beds, whereas the Kammanassie flowed over a country consisting of hard slates and sandstones. Consequently,



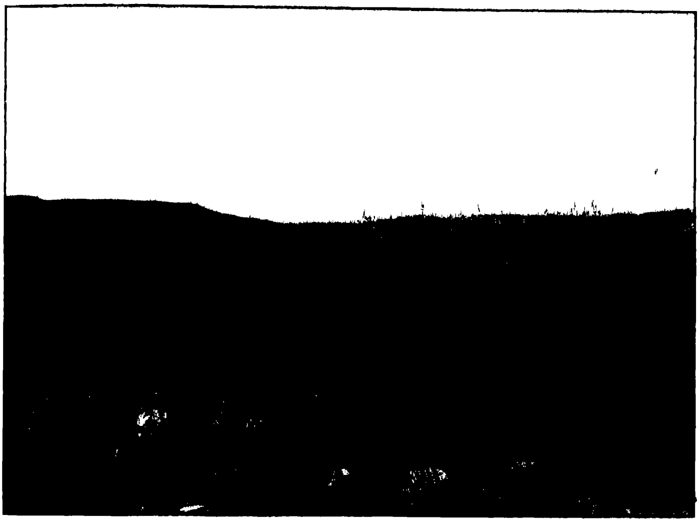
MEIRING'S POORT, A RIVER CUTTING MOUNTAINS 6000 FEET HIGH, ITS BED NOT 1000 FEET ABOVE SEA-LEVEL.

VLAKTE PLAATS, OUDTSHOORN, CREST OF THE ZWARTEBERGEN RISING TO A 6000-FEET LEVEL, WITH A 4000-FEET SHELF BELOW, ALLUVIAL PLAIN IN FOREGROUND.

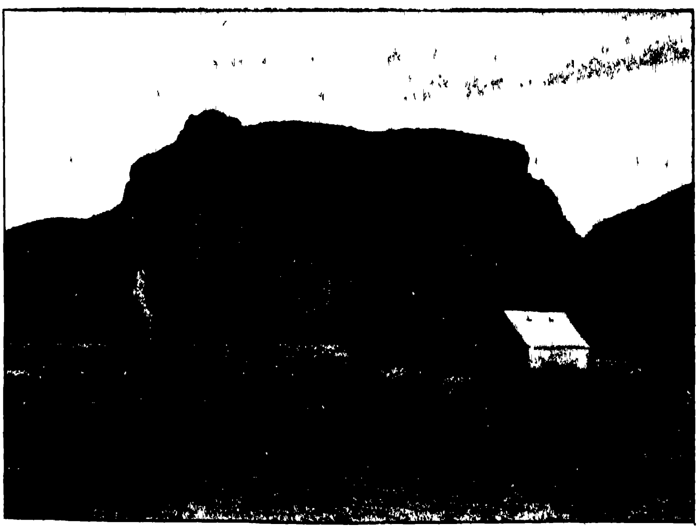
the Olifant's river eroded its bed at a much greater rate than the Kammanassie, and the fall of the side streams in the former became greater than in the latter, till in time the drainage belonging to the top part of the Kammanassie river became transferred to the Olifant's river. East of Uniondale we see the continuation of the structural valley of Kammanassie river, but the side streams, coursing down from the mountains on the north, make for the centre of the valley as if to join the main river, then turn suddenly round and run back through the same mountain range into the Olifant's river, so that the streams have a course represented by the figure of a fish-hook.

In Baviaan's kloof, which lies to the east of the head of the Olifant's river, we find the effect of loosely aggregated sediments let down in among harder rocks exhibited in an extreme degree. The kloof is a wide valley between a double hedge of mountains, the floor of which is represented by the 4000-feet peneplain, still in good preservation. All the rock is hard quartzite belonging to the Table mountain series. In the centre there have been folded down a succession of narrow basins of Uitenhage (Cretaceous) beds. When the rivers took on their last stage of erosion, they rapidly removed the loose contents of these basins, and the streams draining from the mountains on either side were given a tremendous fall, so great, indeed, that they were only able to cut downwards. Being small in volume, the cleft they excavated was correspondingly narrow, and in this way, especially on the north of the fold-basins, a long succession of keyhole gorges has been produced. These are a hundred or more feet actually, with vertical sides, and the width, never much more than 30 feet, and often less, is preserved to the top. They are not due to any structural inequality of the rock, such as might have been produced by a fault, for the gorges wind about just in the same manner as a river would, and are, in fact, cut in the same channels now as when they first started on the 4000-feet level, which is now 1000 feet above their beds. Very few of the gorges have permanent springs in them now, and it is remarkable that these clefts, running into the heart of the mountains, should be dry.

Turning to the north of the folded mountain-bed, we have evidence of the 4000-feet plateau having extended northwards right to the foot of the Nieuwveld escarpment. The Karroo, as far as the drainage areas of the Gouritz and Gamtoos rivers is concerned, is divided into kopje veld and flat karroo. The former is cut out of the 4000-feet peneplain by the streams having a great fall, owing to the main artery, the Gouritz river, striking the mountain ranges on the south at right angles, and traversing them transversely in the direction of greatest erosion. The Gamtoos river, however, becomes entangled in the mountains, and its main tributaries have been forced to flow along the strike of the beds, or the direction of least erosion; consequently, the Gamtoos drainage area has barely been able to clear away the results of



NIEUWE KLOOF, WILLOWMORE, SEEN FROM THE TOP OF THE 4000-FEET PLATEAU. THE ROAD TO BAVIAAN'S KLOOF RUNS DOWN THE KLOOF IN THE CENTRE, AND BAVIAAN'S KLOOF IS THE DEPRESSED AREA TO THE RIGHT. THE ROCK IN SIGHT IS HARD TABLE MOUNTAIN SANDSTONE.



THE BOTTOM OF NIEUWE KLOOF, WHERE THE SLIDE KLOOF ENTERS THE MAIN VALLEY. THE FOREGROUND IS OCCUPIED BY UITENHAGE BEDS, THE LOOSE NATURE OF WHICH HAS ALLOWED RAPID EROSION. THE CLIFF IS A FAULT-FACE ABOUT 800 FEET HIGH.

weathering, and as a result the country round its headwaters has been levelled.

In the Gouritz river head-streams the original flow was southwards; then, at the time of the 4000-feet peneplain, it was northwards; but when greater elevation of the land took place, the old direction became more and more dominant. At first the rivers ran far out to the north, and then turned round and joined some of the larger streams flowing south, and gradually the northward course was shortened till now we find the streams running off the northern face of the folded mountains, making a very short excursion to the north, and joining the main arteries at the place where they enter the mountains, and sometimes even run through part of the mountains to do so. In the flat karroo, however, the downward erosion has not been so rapid, and we find the old northward trend of the rivers still preserved in the tributaries of the Salt river, north of Willowmore. At first sight it is not quite clear that these tributaries are the ends of streams that flowed north from the mountains, but if we look closely, we see that these rivers have been beheaded by the Traka river.

With the further history of the river-system when it flowed over a plain elevated 2500 feet above sea-level, and over others at elevations still less, I do not wish to deal in the present paper. My endeavour has been to bring out as clearly as possible the inter-relation of the old plateaux and the river-system; the minor details of the later plateaux fall into line when one grasps the all-importance of the original peneplains. Before ending this paper, however, I should like to point out the economic value of gaining an insight into the meaning of our river distribution. The great want of South Africa is water, and the most obvious way of procuring a supply is to dam up the rivers so as to catch the flood waters. If we remember that all our rivers flow from a 6000-feet water-parting, we can realize how impracticable such a course would be in the case of the greater number of our river-channels, for the short course and immense fall not only give terrific breaking power to the descending flood, but, the valleys being on such a slant, a very high dam-wall will impound only a small quantity of water. Where, however, there are remnants of the old peneplains preserved by the barring of the rivers, as, for instance, in the north-west of the colony and in the upper reaches of the Gamtoos river, then the conditions are more favourable for dam-making. In practice there is, unfortunately, a factor which prevents dams being a success in the areas of low-grade rivers, for the enormous evaporation that takes place in our half-desert country renders the water which is impounded unsuited for unskillful irrigation.

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RECENT REGULATIONS AND SYLLABUSES IN GEOGRAPHY AFFECTING SCHOOLS.

By A. J. HERBERTSON, M.A., Ph.D.

MANY educational boards have recently revised their regulations and syllabuses for geography, and their action is bound to have a considerable effect in improving the position which geography holds in the school curriculum, and also on the subject-matter which is taught as geography. Whether this healthy movement is or is not an outcome of the suggestions for drawing up syllabuses in geography recently issued by the R.G.S., stimulated by the correspondence in the *Times* and elsewhere which was reviewed in the *Geographical Journal* for January, 1905, it is a welcome one. Fortunately, the intelligent public is interested in the question quite as much as the educational authorities, and it is not surprising that these new regulations and syllabuses have called for editorials and letters, this time mainly in the *Morning Post*.

Three different groups of examination authorities have to be considered—(1) the Board of Education, which has the power of the purse, and therefore the greatest influence in shaping educational movements;

(2) the University Boards, which control the Local and Leaving Certificate examinations, and to a certain extent determine the preliminary training of those entering the universities, as well as professional and commercial life through other avenues; and (3) the Army Board and the Civil Service Commissioners, who determine the standard of education necessary for admission to the public service.

The Board of Education Regulations.

It is difficult to exaggerate the importance of the position now occupied by the Board of Education. The Board now demand, in their regulations for secondary schools, "a course of general instruction, including geography, and extending over four years." They recommend two hours' work in school and one at home every week. If every school sets aside this time for the teaching of geography, there is at last a chance for the teacher of geography to accomplish something in four years.

Each school desiring the approval of the Board for its course in geography should be prepared to submit a course providing—(1) An outline scheme dealing with the great land and water areas in such a way that on completing the course the scholars shall have gone through a geography of the World; (2) a suitably graduated series of exercises connected with the subject-matter of the course.

This is excellent, in that it gives every freedom to a schoolmaster to correlate the geography course with the other subjects of the curriculums, to utilize the local geographical conditions and interests, and to take some account of the special predilections of the teacher himself. That this is the case is precisely laid down.

"The Board desire to leave freedom and wide scope to schools with regard both to subject matter and methods of teaching, which should be carefully adapted to the special conditions existing in each case."

The provisions that the geography of the World must be gone through, and that each scheme must be submitted to the Board, provide against undue specialization or eccentricity. The second clause would be better for the introduction of "practical" before "exercises," understanding "practical" as involving all manner of exercises which the pupil has to work out for himself in field, laboratory, map-room, or library from data supplied to him.

Inspectors are asked to report—(1) as to the stage of instruction attained by the pupils on their entry upon the course; (2) the number of hours per week devoted to geography (two in school and one at home are recommended as a minimum); (3) as to the method employed by the teacher; and (4) as to exercises.

"Before admission to the course scholars ought to possess a general elementary knowledge of the great land masses of the World, the disposition of highlands and lowlands, the chief river-valleys, and the names

and positions of great countries and of a few of the chief towns in each. In addition, a more detailed knowledge of the geography of the British Isles should have been attained. Throughout the preliminary course great emphasis should have been laid on the interrelation of cause and effect. Scholars should possess, also, some knowledge of elementary physiography, including the Earth's shape, simple map-making, the compass; day, night, and the seasons; formation of mountains and rivers; the oceans; climate; minerals; plant and animal life."

If the Board can secure this they will have done a great service, and made it impossible to continue merely the old fact studying which did duty for geography. We fear that at present few pupils of twelve will be able to stand this test. The main fault of these preliminary requirements is the absence of any reference to human conditions other than political. The young child is much more interested in people, their plants and animals, their industries and modes of life, than in mountains or deltas or climate. The geographical teaching in early years should be concerned much more with human beings and their surroundings than with a logical presentment of so-called mathematical, physical, and biological geography on the lines of the text-book of physiography. The best logical order is not necessarily the best pedagogical order.

The methods employed by the teacher are to be such as "produce a vivid impression of connected facts through considerations, such as those of cause and effect and practical bearings of the facts selected."

An atlas is essential, but a text-book is not demanded where a teacher has special knowledge, and in all cases teachers are to bring the information up to date.

The school is recommended to possess wall-maps, globes, diagrams, relief models, specimen products, photographs, and a collection of county and detailed maps for references. It is a matter for congratulation that the Board are clear on these matters, for teachers find it hard to convince school authorities that geography can no more be taught without an adequate equipment than can chemistry or physics. A geographical department, whether in a school or a university, will always be one demanding as much, if not more, money than any other department. It would have been well had the Board said "strongly recommended," better still if it refused to recognize the geography teaching in a school which was not so equipped, after say two or three years from the publication of the recommendation.

The following recommendations on exercises, if interpreted in a liberal spirit, should yield good results. The difficulty will be to find teachers sufficiently well trained in geography to carry them out efficiently. "(1) *Questions and answers* (graded in difficulty from year to year) designed to elicit, through causes and consequences, subject-matter for entry in the scholars' note-books. No facts should be stated

without reasons; and the reasons are best expressed by the class itself. (2) *Notes and diagrams.*—Scholars' notes should not contain merely reproductions of lessons, but also worked-out problems together with original maps and plans. (3) *Mapping.*—Maps and diagrams should be regularly set, and in each case with a definite object, *i.e.* to illustrate a lesson from a particular point of view—physical, political, commercial, etc., no extraneous names or signs being inserted. Scholars should be required to justify each name, etc., inserted. (4) Field-work, excursions, factory visits, and the like may occasionally be used with good effect."

That the Board should recommend field-work and excursions is a great matter, for many teachers who have not tried them declare that it is impossible either to find the time for them or to carry them out with profit. Competent teachers who have tried them tell different stories.*

The Board append suggestions for a syllabus for a four years' course, which, like all syllabuses, can be very easily criticized. They, however, distinctly state that it is "given merely as illustrating one of the many ways of dealing with the subject-matter." The remarks already made apply to the preliminary knowledge expected. At present probably few pupils would possess it, and much of the first term, if not of the first year, might have to be devoted to giving it to them. With a better-organized scheme of instruction than that commonly followed, it is by no means too much to expect, provided that the human element is introduced and emphasized. Eight, however, is too early an age for systematic geographical lessons, which can hardly be profitably begun before ten. Before ten, local geography should come in as part of a nature-study course, and the information about foreign lands should be purely descriptive.

The four years' course suggested takes up the geography of Europe in the first year, of America and Africa in the second, of Asia and Australia in the third, and regional contrasts in the fourth. It has the merit of being geographical, but it hardly brings out the necessity for increasing the quality as well as the quantity of knowledge, nor is the human aspect sufficiently recognized. From the point of view of order of difficulty, the southern continents should certainly come before the northern ones, unless it be North America. It would probably be a good plan to begin any four years' course with a revision of what the pupils have previously learned about the World in general, as well as about the British Isles. The re-survey of the British Isles and the World at the end of the course is a valuable feature.

* See the *Scottish Geographical Magazine* for 1897, the *Geographical Teacher*, *passim*, and numerous articles by Miss Dodd and many other writers in educational and other

Notes appended to the sample syllabus recommend that pupils should be taught the interpretation and use of Ordnance Survey and other maps. It would have been well to insist on this at the outset of the course. The cheapness of Ordnance maps for teaching purposes under the new regulations might have been mentioned. There is no excuse for every boy and girl in a secondary school not possessing at least the 6-inch or the 1-inch sheets of the school district.

The Board also suggest that "special lessons may be introduced in the course, *e.g.* in first year, the climatic phenomena of Europe as leading up to general principles; in second year, distribution of products, illustrated by American examples; in third year, effects of environment; in fourth year, geography applied to practical questions of the day."

The recognition of the principle of making geographical lessons geographical, and of introducing physical and other principles, if not already learned elsewhere, when they are needed, is a very important step in advance, though Europe is hardly the continent we should recommend for climatic investigations leading up to general principles.

The Board of Education's regulations are therefore to be welcomed as a substantial mark of progress. They can be criticized in details: the human element is left out in earlier stages, the order of presentation might be improved, the insistence on practical work in class-room and field might have been stronger; but on the whole they show a distinct advance on any previous official pronouncement.

Joint Certificate, Local and Leaving Certificate Syllabuses.

Oxford Local and the Oxford and Cambridge Joint Board syllabuses are practically identical. Each is divided into—A, General Principles of Geography; (*a*) Mathematical Geography, (*b*) Physical Geography, (*c*) Geography of Plants and Animals, (*d*) Geography of Man; B, The Geography of selected regions. For Oxford Junior Locals the British Isles, for Seniors the British Empire, and for both another prescribed region; for leaving certificates British Isles and Empire, and for Higher Certificate North America in addition. A, (*a*) and (*b*) are the ordinary subjects treated in text-books of physiography, (*c*) deals with vegetative regions and their animal life—not floras and faunas, and (*d*) contains one section on the races of men, and another on the environmental control of human activities and organizations. In (*c*) and (*d*) we find traces of the geographical spirit, while (*a*) and (*b*) remain at the old South Kensington physiography stage, with land-forms added.

The Cambridge Local regulations recognize geography as a preliminary subject, but not as an independent subject for junior or senior certificates, where it is attached to history, while physiography is a subject here called physical geography. The Higher Local

regulations demand a knowledge of — (*a*) Physical Geography, (*b*) Political and Economic Geography, and (*c*) History of Geography; but one is surprised to find as special subject for 1907 Africa south of the equator. Has the northern part of the Congo basin or of the Victoria Nyanza to be left out of account?

The Oxford Higher Local syllabus is much the most satisfactory, and is at once less rigid and more geographical in its specification of the contents of general geography.

Most other universities issue syllabuses somewhat similar either to those of Oxford or of Cambridge, where they recognize the subject at all. For instance, the Joint Matriculation Board of the Universities of Manchester, Liverpool, Leeds, or Sheffield permits geography or Natural History to be selected as an optional subject. Two papers are set, one on Physical Geography, and one on Political and Commercial Geography.

The University of London is an exception, and the matriculation syllabus published by it is the most satisfactory of any, though the subject receives the cumbrous title of Physical and General Geography instead of Geography.

"The following regions in decreasing detail . (*a*) England and Wales, (*b*) Scotland and Ireland, (*c*) Europe, the Mediterranean, the North Atlantic, North America, and Greenland, (*d*) the remaining Continents. Recapitulation from the point of view of the British Empire.

"Attention should be directed to the following aspects of the several regions: The broad contrasts and chief features of the land relief; the chief features of the coastal outline as related to those of the relief; the disposition of the water-partings and of the chief river-basins; the winds and sea-currents, distribution of rainfall, the climatic contrasts, and the resulting agricultural contrasts; the districts of exceptionally dense or rare population considered in relation to their position, natural resources, and industrial activities; the arrangement of the political divisions upon the land-relief and with reference to the drainage system; the analysis of the positions of the great towns.

"Candidates will be expected to understand the main physical causes of the phenomena they describe, such as variations of atmospheric temperature and pressure, their seasonal and regional distribution; the causes of precipitation, winds—their cause and prevalence in different regions, the interpretation of weather charts, and the meaning of the network and other conventional symbols employed in maps. Time need not be spent in elaborate map-drawing. The answers in the examination should be illustrated, where necessary, by simple diagrams, correct in general proportion, but without detail. Candidates may be expected to identify maps without names, to insert upon

such maps the position of geographical features, and to work problems as to local time."

In connection with the Junior Schools certificate, the University of London has followed the plan of examining on the syllabus submitted by the teacher. This has drawbacks as long as teachers are untrained in geography, and is apt to result in the syllabus specifying the pages of some text-book which has been used. Probably a general syllabus, somewhat on the lines of the matriculation one, but of a more elementary nature, with a knowledge of the World in general and of the British Isles in particular, plus an additional area or aspect of geography selected by the teacher, for which he submitted a syllabus to the university, would ensure an adequate general knowledge while allowing for the special interests of the teacher or the district.

Army Examinations.

The regulations for the army qualifying examination couple geography with English history and divide the subject into—(1) General; (2) British Empire, rather more in detail. General geography consists of the main physical features of the World, the elementary principles of map-construction, and elementary political geography. This is too vague a syllabus to be of much value.

Commencing in November, 1905, no geography at all is required for the competitive examinations!

Though military history and geography is a subject taught at Sandhurst, no geography is required from university candidates for army appointments! nor at Woolwich!

The most eloquent comment is to mention such a state of affairs being in existence in 1906.

On the other hand, military geography of a comprehensive nature is an obligatory subject for the entrance examination to the Staff College, though economic conditions might profitably receive more attention. Military, general, and strategical geography in particular are subjects in the first and second year course at the college, though the subject is not mentioned in the tabular statement of examinations.

The Civil Service Examinations.

During the past year the Civil Service Commissioners have issued syllabuses in geography for several examinations, which have a number of interesting and valuable features. The most striking is, that each begins with "The different regions of the Earth—forest, grass, and desert; hot, cold, and temperate—and the kinds of human activity suited to each." The spirit of this beginning is very different from that exhibited in most geographical text-books and teaching. If the Civil Service Examiners can inspire a scientific and "cultured" attitude in their candidates, they will do more than secure profitable

civil servants; they will greatly improve the quality of a secondary education, which at present is given too much on the Strassburg goose-feeding principle, producing a diseased though highly marketable liver.

The first paragraph is followed by one which may be looked upon as demanding the physical explanation of these phenomena, although this is not explicitly stated. Land-forms and maps follow. After this, the chief physical features of the Earth, position of chief cities and countries, rivers and mountain ranges are to be known, probably as a preliminary to the examination of natural features and physical conditions on the habits and occupations of man and the growth of towns. Finally, two or three natural regions are mentioned for more detailed study. Had the connection between the successive paragraphs of the syllabus been explicitly stated, it would have been a great advantage, though no doubt the intelligent teacher will do this for himself. On the whole, the Civil Service Commissioners will aid the efforts of those who are trying to make geography a profitable educational discipline.

While improving the quality of the geography demanded of candidates for the less important civil service appointments, the Civil Service Commissioners have not yet even recognized it as an optional, much less as a vital, element in the training for the higher appointments where it is indispensable. Our university classes show that this need is being felt, especially in the career of those preparing for colonial appointments. It is to be hoped that this very necessary recognition on the part of the Civil Service Commissioners will not be long delayed. The inclusion of geography in the curriculum of secondary schools, the improvement of syllabuses, and the effective teaching of geography in every English University, except Durham and Sheffield, are sufficient to justify the Commissioners in taking immediate action.

General Remarks.

Syllabuses may be divided into classes. One class demands, under the title of Geography—(*a*) a knowledge of what is otherwise known as nature study, or physiography, the principles being illustrated by selected geographical facts; and (*b*) an analysis of the topography of selected areas, their political divisions and economic conditions. The class at the other extreme insists on the geography of the World in general and of selected areas in particular, in all its relations, with the introduction, where they naturally occur, of such physiographical explanations as are not already understood by the pupil. There are many intermediate forms between this systematic physiography with geographical illustrations and this systematic geography with physiographic explanations.

Obviously a good teacher can profitably utilize either class of syllabus,

both for instructing and for educating his pupils. In nearly all modern syllabuses the old gazetteer geography is more or less definitely eliminated, and cause and effect are explicitly laid down as objects of study. There is little evidence of stupid conservatism and much of real effort to make the subject an educational one. The differences in syllabuses are mainly due to the different conceptions of the scope and discipline of geography held by their framers. The most encouraging feature is that authorities should be dissatisfied with the older syllabuses, and attempt to frame something better.

The two classes of syllabus, however, differ profoundly. They involve different outlooks on the world, and yield a different discipline. The physiographic outlook is that on the *properties* of matter, of energy, and of life. It is not the geographical outlook, which is concerned with the *distribution* of matter and energy and life, and of the associations of these phenomena on the Earth's surface. Geography deals with the World as a whole, and with the natural subdivisions of the World recognized as unities. The mathematician or physicist feels no compunction about selecting half a dozen unnatural political divisions, bounded, it may be, by lines of latitude or longitude as a subject of special geographical study. The biologist would have some qualms about setting, let us say, the upper half of the forearm, the left side of the nose, and the big toe as special subjects, yet when he approaches geography he is willing to treat the World in a similar fashion. The politician naturally studies the Gold Coast Colony, British New Guinea, and even Hong Kong as units, but even he, one would expect, would hardly prescribe their investigation without examining contiguous areas. Yet this is what so many framers of syllabuses do. With the best will in the world, they have grasped only the fact that geography treats of the Earth's surface, but not the more important one that it does not do so as the mathematician, as the physicist, as the biologist, or as the politician treat of it. They make geography a means of teaching a little mathematics, or physics, or biology, or politics. When a schoolmaster complains that his already over-full time-table cannot be choked with this, useful though it be, we feel some sympathy for him. The claim for the recognition of geography is not merely its usefulness; it is because of its value as a discipline not to be obtained from other subjects taught in school.

Because of this, those who have received a geographical training, in addition to a physical, biological, or "humanistic" training, and have come to recognize that there is a geographical point of view as distinct as that given by any one of these disciplines, object to the first class of syllabuses almost as much as the schoolmaster who will have nothing of geography in his school. A syllabus in geography should be so framed as to develop in those following it a geographical perception, as well as information about the salient features of the World. When such

syllabuses prevail and are followed, a new and invaluable instrument will be given to the schoolmaster.

Frankly the question of the position of geography in schools cannot be adequately discussed without a reconsideration of the whole curriculum. The present lopsided courses cannot remain, and something more is wanted to secure a well-balanced education than to patch the existing over-specialized and rather narrow training which they afford.

THE AREAS OF THE OROGRAPHICAL REGIONS OF ENGLAND AND WALES.*

By NORA E. MACMUNN.

THE following table has been compiled from planimetric measurements made at the School of Geography, Oxford, on the orographical map of England and Wales, recently published in the *Geographical Journal* (vol. 24). The limits of the natural regions adopted in making the measurements are shown on the accompanying sketch-map. As a rule, the plains have been measured to the 250-feet contour-line, and the hills have not been considered to begin below that level. Every measurement has been made at least twice, and the mean taken. In many cases four, six, and even eight measurements have been used in determining the mean.

The total area of the planimetric measurement was 58,017·1 square miles. The official figures used in the last census were 58,324·2 square miles. The present tables have been reduced from the original planimetric measurements by applying the correction necessary to reduce the area of the map to that of the official figures.

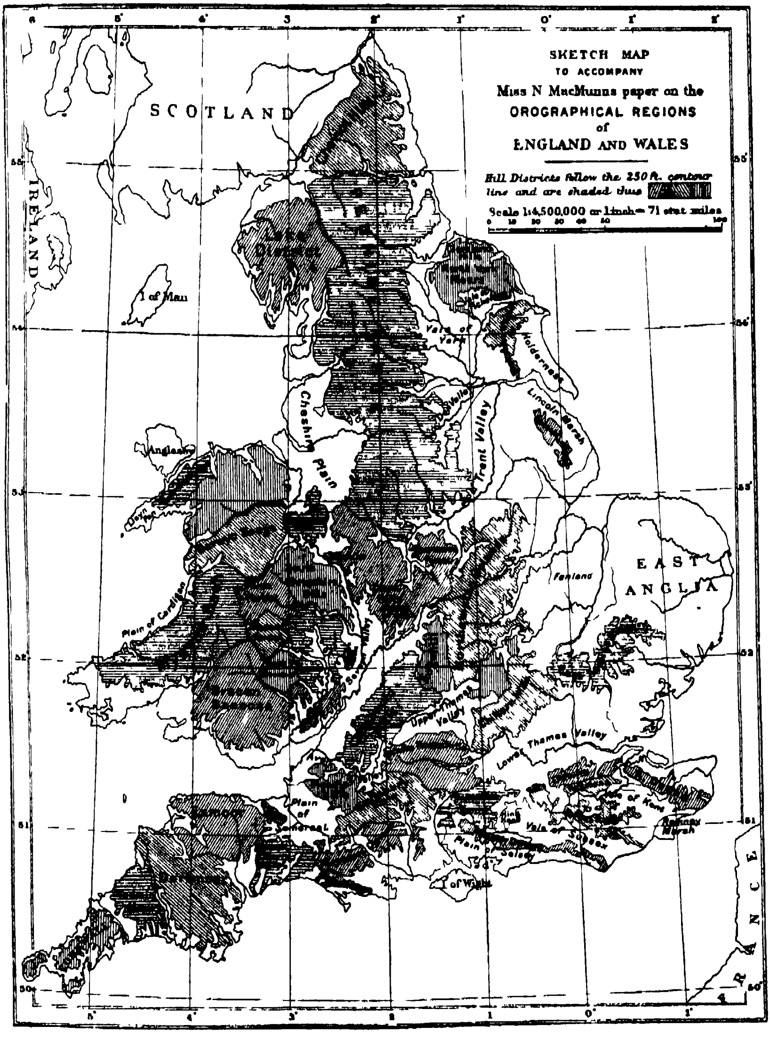
The average height of England and Wales, calculated from these measurements, is 385 feet.

AREA OF OROGRAPHICAL REGIONS OF ENGLAND AND WALES.

Region	Under 250 feet.	250-500 feet	500-1000 feet	1000-2000 feet.	2000-3000 feet.	Over 3000 feet	Totals
	Square miles	Square miles.	Square miles.	Square miles	Square miles	Square miles	Square miles.
Cheviot Hills (south of the English border) ...	—	461·2	637·0	307·7	7·3	—	1413·2
Pennine Chain	—	1609·1	2888·5	1620·0	113·4	—	6231·0
Lake District Mountains †	—	453·2	512·0	311·2	65·8	-	1372·2
West Coast (border to Ribble)	974·3	—	—	—	—		974·3
Cheshire Plain	1450·4	22·0	—	—	—	—	1472·4
East Coast (border to Tees)	659·7	—	—	-	—	--	659·7
Tees Valley	289·1	—	—	—	—	—	289·1
Vale of York	1242·8	—		—	-	—	1242·8
Vale of Pickering ...	268·0	—	—		—	—	268·0
Holderness	519·3	—	-	—	—	—	519·3
Don Valley	397·7	—	—	—	—	-	397·7
North York Moors (with Cleveland Hills) ...	—	323·9	325·9	82·7	—	—	732·5
Yorkshire Wolds	—	205·0	51·2	—	—	—	256·2
Trent Valley (with Lincoln Marsh)	2835·0	29·3	—	—	—	—	2864·3

* Research Department, December 13, 1905. Map, p 289.

† There is a small area over 3000 feet in Cumberland (Scafell, Helvellyn, and Skiddaw) occupying 0 178 square mile, but which is not shown on the map.


SKETCH MAP
TO ACCOMPANY
Miss N MacMunns paper on the
OROGRAPHICAL REGIONS
of
ENGLAND AND WALES
Hill Districts follow the 250 ft. contour line and are shaded thus
Scale 1:4,500,000 or 1 inch = 71 stat. miles
SCOTLAND
IRELAND
I of Man
Lake District
Vale of York
Holderness
Lincoln Marsh
Trent Valley
Cheshire Plain
Anglesey
Fenland
EAST ANGLIA
Plain of Cardigan
Upper Thames Valley
Lower Thames Valley
Vale of Kent
Romney Marsh
Vale of Sussex
Plain of Selsey
Plain of Somerset
I of Wight
FRANCE

Region	Under 250 feet.	250–500 feet.	500–1000 feet	1000–2000 feet	2000–3000 feet.	Over 3000 feet.	Totals.
	Square miles.	Square miles	Square miles	Square miles	Square miles.	Square miles	Square miles.
Lincoln Wolds	—	146·3	7·3	—	—	—	153·6
Fenland	1501·4	—	—	—	—	—	1501·4
East Anglia (Fens to Thames Divide) ...	4266·4	36·6	—	—	—	—	4303·0
Plain east of Fens (Cam to Welland)	1275·3	—	—	—	—	—	1275·3
East Anglian Ridge ...	—	614·5	—	—	—	—	644·5
Triassic Hills (between Pennines and Northampton Uplands)	—	1611·6	231·9	—	—	—	1843·5
Northampton Uplands ...	—	1566·3	78·1	—	—	—	1644·4
Edge Hill	—	265·8	100·1	—	—	—	365·9
Cotteswold Hills	—	564·0	306·3	3·6	—	—	873·9
Jurassic Hills (between Cotteswolds and Chilterns)	—	241·8	3·6	—	—	—	245·4
Chiltern Hills	—	578·5	179·3	—	—	—	757·8
Upper Thames Valley ...	384·3	126·3	1·8	—	—	—	512·4
Lower Thames Valley ...	1615·8	199·8	—	—	—	—	1815·6
White Horse Hills ...	—	520·0	292·9	—	—	—	812·9
Mendip Hills	—	197·5	88·0	—	—	—	285·5
Salisbury Plain	—	465·1	69·5	—	—	—	534·6
Western Downs	—	344·2	109·9	—	—	—	454·1
Hampshire Downs ...	—	341·8	53·8	—	—	—	395·6
Hind Head	—	63·5	20·7	—	—	—	84·2
North Downs	—	168·3	139·1	—	—	—	307·4
Ragstone and Forest Ridges	—	410·1	58·6	—	—	—	468·7
Vale of Kent	708·6	—	—	—	—	—	708·6
Romney Marsh	87·8	—	—	—	—	—	87·8
N.E Kent (Foreland of North Downs)	358·8	—	—	—	—	—	358·8
Vale of Sussex	646·5	—	—	—	—		646·5
South Downs	—	132·5	64·2	—	—		196·7
Plain of Selsey (Beachy Head to Itchen-Test divide)	483·2	—	—	—	—	—	483·2
South Coast (Itchen-Char)	974·5	—	—	—	—	—	974·5
Isle of Wight	117·0	22·0	7·3	—	—	—	116·3
Purbeck Downs	—	55·0	14·6	—	—	—	69·6
Blackdown Hills	—	219·7	131·6	—	—		351·3
Quantock Hills	—	29·3	17·0	4·9	—	—	51·2
Exmoor	—	385·0	431·2	121·1	—	—	937·3
Dartmoor	—	570·6	418·8	166·8	—	—	1156·2
Bodmin Moor	—	256·2	191·0	14·6	—	—	461·8
Cornwall (south of Fowey and Camel)	380·7	274·5	65·9	—	—	—	721·1
Fowey to Plain of Somerset	792·8	—	—	—	—	—	792·8
Plain of Somerset ...	659·7	—	—	—	—	—	659·7
Avon (Bristol) Valley ...	446·7	36·6	—	—	—	—	483·3
Severn Valley (with Wye and Usk)	1690·7	—	—	—	—	—	1,690·7
South Shropshire Hills ...	—	340·6	260·0	65·8	—	—	666·4
North Shropshire Hills ...	—	305·6	2·0	—	—	—	307·6
Malvern Hills	—	22·0	14·6	—	—	—	36·6
Hereford Hills	—	413·8	120·5	—	—	—	534·3
Monmouth Hills	—	137·4	103·4	1·8	—	—	242·6
Black Mountain	—	19·8	102·5	51·3	29·3	—	202·9
Brecon Beacon (and outliers north and south)	—	265·7	178·2	481·4	20·1	—	1,245·4
Radnor Forest	—	16·0	125·7	80·3	3·7	—	225·7
Clun Forest	—	29·3	215·0	185·1	—	—	429·4
Mynydd Bach Range ...	—	443·1	691·1	395·4	7·3 (Plynlimon)	—	1,536·9

Region.	Under 250 feet	250–500 feet.	500–1000 feet.	1000–2000 feet.	2000–3000 feet.	Over 3000 feet.	Totals
	Square miles.	Square miles.	Square miles.	Square miles.	Square miles.	Square miles.	Square miles.
Berwyn Range	—	150·0	347·5	388·6	22·0	—	908·1
Snowdon Range	—	102·5	82·3	79·7	22·0	3·6	290·1
Mountains between Snowdon and Berwyn Ranges	—	216·0	404·2	336·3	9·1	—	965·6
Lleyn Penin	182·8	16·2	2·0	—	—	—	201·0
North Wales coastal plain	182·9	—	—	—	—	—	182·9
Plain of Cardigan ...	124·5	3·6	—	—	—	—	128·1
South Wales coastal plain (border to St. David's Head)	805·9	263·6	40·2	—	—	—	1,109·7
Anglesey and Holy Island	159·0	42·2	—	—	—	—	201·2
Totals	26,481·6	16,364·5	10,476·3	4,698·3	300·0	3·6	58,324·3
Percentages ...	45·4	28·0	18	8	0·5		

REVIEWS.

EUROPE.

Sicily.

'Die Insel Sicilien.' By G. Wermert. Berlin: Reimer (Vohsen). 1905.

These exhaustive statistical treatises on portions of foreign territory are a speciality of German scientific literature. They stand midway between a Foreign Office special report and the typical British work of travel. We have indeed nothing that quite corresponds to them; for even such books as Lord Curzon's 'Persia' or Sir Harry Johnston's 'Uganda' admit a leaven of narrative. The fact is that we have not got the German public with its amazing appetite for, and power of digesting, solid matter. If such a book as Dr. Wermert's 'Sicilien' could be produced in this country, it would be merely as a necessary book of reference, elaborately broken up into sections and subsections, full of tables and lists, and supplied with minute registers of contents, subject headings to chapters, and copious classified indices. No one would dream of reading it consecutively, but all who had to do with Sicily would use it as a lexicon. The German book, however, comes out, written in long continuous chapters, like any other form of narrative, without paragraph marks, subsectional titles, page subject-headings, or any other help by the way to the searcher. The table of contents is a mere list of main chapter titles, and the two indices of names and subjects, appended to a closely written volume of about 250,000 words, contain scarcely 1000 headings, of which very few have more than one reference. The only possible inference is that there is a public in Germany which is expected to read a book of this kind from cover to cover, and needs no such help in its grim task as is demanded by the less seriously minded Briton.

On the other hand, this book is not quite sufficient for the small body of Sicilian specialists; for it gives hardly any references, except to general works. Its manner of treatment is very like that of an encyclopædia, intended to give as much information as any ordinary inquirer could possibly desire, but not to satisfy the extraordinary student. Dr. Wermert has verified his facts by patient study on the spot, and they may be accepted without reserve; but they are not all

the facts. For instance, his long chapter on Historical Development is a mere sketch, very defective in regard to the period before written records. In a volume which professes to treat of the island in its economic, agricultural, and social relations only, this chapter might just as well have been omitted altogether.

If other volumes are to follow dealing with the other Italian provinces, the whole will make a valuable dictionary of Italian Social Order, somewhat in the style of, but much more reliable than, Cuinet's 'Turquie d'Asie.' But, whatever is expected of the German public, that of the rest of Europe will certainly consult these volumes only as works of reference; and we hope they will be better designed and arranged to that end than the present volume. The latter, however, whether or no, will be quite indispensable to the student of the actual state of Sicily.

ASIA.

Some Indian Borderlands.

'Report of Archæological Survey Work in the North-West Frontier Province and Baluchistan.' By M. A. Stein, PH.D. Peshawar: Government Press. 1905. *Plans and Illustrations.*

Our old geographical friend, Dr. Stein, has been doing useful work again as archæologist in India by systematic examination of ancient sites and traditional remains on the North-West Frontier. From Nushki and Kharan, through Loralai and Thal Cotiali, to the Bannu and Kohat districts he has apparently left nothing unvisited which might by any chance contribute to the interest of Indian archæology. So far, whilst there is much in his report which is calculated to throw new light on the historical aspects of many localities which have never been systematically examined before, and one or two old frontier traditions have been displaced, there is nothing much which would attract great attention from the general public outside India. Dr. Stein supports General Cunningham's identification of Heuen Tsangs Fa-la-na (Sanskrit Varna, or Barna) with the Bannu district, and has something new to say about the ruins of Kafir Kot near the junction of the Kurram river with the Indus; but it is further north, on the banks of the Indus, ere yet that river has debouched into the flat Punjab plains, that the interest of this particular report is centred, for it deals with the thrilling story of Aornos, and the identification of that historic rock with Mahaban.

This theory was first advanced by the late Colonel Abbot, and the identification was based on the general appearance of Mahaban and its surroundings, from a distance, together with a curious resemblance between local names and the old Greek traditions. One theory after another had previously been abandoned, until it seemed as if that of Mahaban was the only possible solution of the much-vexed question (in spite of certain radical discrepancies between Mahaban topography and Arian's description of the Aornos rock, which might have been detected even at a distance), and local antiquarians finally pinned their faith to it, *faut de mieux.* And now Dr. Stein has ruthlessly destroyed our tentative convictions, and set the argument rolling again. Hitherto no European has been able to reach Mahaban and return to tell the tale—the Gadun tribe has taken care of that—and it was not without some risk that the venture was finally made by Dr. Stein, under the auspices of the local political officers, Colonel Deane and Mr. Pipon. The result of the local examination of existing ruins and the survey of the site is conclusive. The maps and diagrams in the report are alone sufficient to prove that there can be nothing in common between Mahaban and the rock described by Arrian. "Of the plateau on the top of Mahaban, which the assumed identity of the mountain with Alexander's Aronos made me (like others) look out for, in accordance with the plain

indications of the classical historians, there was no trace to be seen anywhere." The highest point of the Mahaban ridge is occupied by a pentagonal fort, called Shah Kot, in which Dr. Stein and his Gadun escort spent a wet and miserable night. From this summit next morning he obtained a magnificent view of the surrounding hills, but nowhere could he detect any resemblance to the traditional topography of Aornos. It is, indeed, impossible, after studying Dr. Stein's diagrams and the account of his remarkable expedition, to accept Mahaban any further as the representative of Aornos; and it is disappointing that, with the disappearance of the Mahaban theory, no other suggestion is forthcoming which might lead to identification. There is, indeed, a very plain doubt expressed as to the "truly historical character of this, and perhaps other, episodes of Alexander's campaign." Such a suggestion is difficult at first to accept in face of the remarkable way in which the general truth of Arrian's history has been confirmed by surveyors who have identified his route and the localities mentioned in detail, from Northern India to Karachi, and thence through Makran to Persia. What are the other episodes to which Dr. Stein refers? Possibly the story of Nysa and the Nyseans may still be held as unconfirmed. In that case, we may hope that the determined energy and courage which has led Dr. Stein to the summit of Mahaban may eventually guide his footsteps to the slopes of the Koh-i-Mor.

After disposing of Mahaban, however, Dr. Stein rendered valuable service to archæology by identifying the site of "Buddha's body offering" (the holy spot where he offered his body to feed a starving tigress), which has ever been one of the most sacred of Buddhist bournes of pilgrimage. Applying locally the same critical process of topographical analysis, and his own exceptional store of legendary knowledge and oriental scholarship, to his observations, Dr. Stein has no hesitation in assigning the site of that ancient gathering-place of the faithful to the hill of Banj, also within the territory of the Gaduns, south of Mahaban. Here he found suggestive ruins which coincided closely with the detailed description of the sacred "temple of the collected bones" and its surroundings, as given by the Chinese travellers Song Yun and Heuen Tsang. Even the red-stained earth and the aggressive thorny vegetation were there. Nothing indeed appears to be wanting in order to marshal the evidence in support of the theory to a positive conclusion. It is at least satisfactory to claim this constructive theory as something of a set-off against the lamentably destructive evidence which has again launched Aornos into the regions of speculation. The value of these most recent additions to our antiquarian knowledge of Northern India will be recognized by all travellers in those regions, and by all scholars all over the world; and it is much to be hoped that the "Account of the Ancient Geography of Northern India" with which Dr. Stein has been entrusted for the 'Encyclopædia of Indo-Aryan Research,' will have a far wider circulation than is usually accorded to reports written for the Indian Government similar in character to the one under review.

But why should Dr. Stein limit himself to Northern India? There is already a considerable store of information to be culled from past political and survey reports relating to the mediæval geography of Eastern Persia, Makran, and Southern Baluchistan, extending to North-Western Afghanistan and the Oxus, including much that is of the deepest interest in connection with the Arab occupation of the Indus valley. All this still awaits the scholar and antiquarian to collate and co-ordinate, piecing together the scattered patchwork into a connected whole in illustration of one of the most fascinating periods of the commercial history of the East. Even Las Bela has its interest for the Buddhist scholar. One point only may be noted here for the benefit of any future compiler of such a work. Dr. Stein appears to me to attach too much importance to the measure of a

distance indicated by a "day's march" in the records of Chinese and Arab geographers. A day's march was just as much or as little to them as would usually take the traveller from one resting-place to the next. It extends (when the march was a day's march for a riding-camel) to 80 miles, or where one desirable resting-place is fairly close to the next, it may diminish to 10 miles.

We wish Dr. Stein all success in his next venture, which will carry him far beyond India.

T. H. Holdich.

CELEBES.

'Reisen in Celebes ausgeführt in den Jahren 1893–1896 und 1902–1903.' Von Paul und Fritz Sarasin. 2 vols Wiesbaden: 1905. *Price* 21*s.*

Readers of the *Journal* need no introduction to this indefatigable and inseparable pair of explorers, whose wanderings it has followed step by step for nearly two decades, especially as concerned with Celebes, most attractive because least known of all the lands explored by them. From the dates given in the title of this work, it will be seen that an interval of six years lay between their two successive visits to the great Malayan island, from the map of which they have removed so many blank spaces. Here, as elsewhere, their programme was ambitious (I do not use the term in an invidious sense), embracing the various departments of geology, botany, zoology, and ethnology, all of which afforded ample scope for the display of their great experience and greater zeal for the advancement of the natural sciences. As their rich collections, and numerous excursions in every part of the fantastically-shaped island, have already been described (see especially vols. **20**, p. 229; **21**, p. 454; and **22**, p. 458 of the *Journal*), it may here suffice to give the broad conclusions that Drs. Sarasin have arrived at regarding the fascinating problems connected with the geological evolution of Celebes, and the history of its very peculiar flora and fauna.

Despite the views held by Wallace and some other distinguished observers, Celebes is to be regarded as of relatively recent origin. As shown by the extensive limestone strata, it was covered in early Tertiary times by a shallow coral sea, above which the mountain ranges did not begin to rise till about the Miocene age. The sands and marls of this age, the "Celebes Molasse," as they are here named, are largely developed, and their contents, partly brackish water deposits, partly coal, point to the existence of dry land which may at that time have already been occupied by Asiatic species. In all the animal groups there are members of early types which must belong to this first invasion, and are now represented, for instance, by the babirusa and by the molluscs of Lake Posso. The continuous upheaval of Celebes and surrounding islands during Miocene and Pliocene times brought about extensive land connections, as must be inferred from the character of the present insular fauna. Thus North Celebes was joined through Sangi with the Philippines (Mindanao), South Celebes with East Java, Flores, and the other lesser Sunda islands, and East Celebes through the Moluccas with New Guinea and Australia. Along all these routes migratory movements took place both to and from Celebes. Thus Javanese species passed through Celebes and the Moluccas eastwards, Philippine animals through Celebes southwards to Flores, and Australian and New Guinea forms to Celebes and thence northwards to the Philippines, while many wanderers stopped in Celebes without travelling further. In course of time several of the last-mentioned developed new species, and even new genera, whose origin can be inferred only from the spread of the nearest related forms. Others, again, have remained unmodified as living witnesses to former land connections. Of special importance for the reconstruction of these vanished land routes are

those *species* which Celebes *exclusively* possesses in common with one or other of the above-described regions, without ranging further over the archipelago. Such species can have reached Celebes only by a direct route joining it with some particular land, since no other way was available for their spread. Celebes possesses representatives of such exclusive species, which are elsewhere found either in Java alone or in the Lesser Sunda group, or in the Philippines, or in the Moluccas alone. Totally different are the relations with Borneo. Although the two islands have many animal forms in common, these are also found either in Java or the Philippines, whence they may have reached Celebes. There are no species which are exclusively peculiar to Borneo and Celebes, and from which a direct land-route between the two islands might be necessarily inferred. No mammals, birds, reptiles, crabs, snails, chinches, or ants are limited to both islands; hence the Asiatic-Sundanese forms found in Celebes did not come directly from Borneo, but from Java to South Celebes, or else from Borneo round by the Philippines to North Celebes. Thus the narrow Macassar strait flowing between Borneo and Celebes is seen to be of great importance as a biological divide, and this so far corresponds with the Wallace parting-line which is also drawn through the same strait. But in other respects the views of these eminent naturalists are widely divergent, since Wallace regards Celebes as a land of "remote antiquity," while the Sarasins treat it as of "relatively recent" origin.

Ethnologists will be glad to find here a very full account of the primitive Toála cave-dwellers of south-west Celebes, about whom so many vague reports have for some time been in circulation. They were twice visited by our travellers, who regard them as the true aborigines quite distinct from the present Malayan populations, and perhaps forming a connecting link between the Veddas of Ceylon and the Australians. They may have reached Celebes before the subsidence of the former land-connections, at a time when early man was migrating all over the Australasian lands.

These well-printed volumes are richly equipped with a copious index, 1 general and 10 sectional maps, 12 coloured plates, and 240 inset illustrations.

A. H. KEANE.

AFRICA.

NORTHERN SOMALILAND.

'With the Abyssinians in Somaliland.' By Major J. Willes Jennings, D.S.O., R.A.M.C., and Christopher Addison, M.D., F.R.C.S. London. Hodder & Stoughton. 1905.

This interesting book describes a journey from Gumburra made with the Abyssinian Expedition into Somaliland ("a land of thorn trees, of desert, and of prairie") under Colonel Rochfort. This force acted under orders from General Egerton, and its object was to check the Mullah in his wanderings, and by its occupation of Wardair and Gorabai to close against him an important line of retreat. The book contains graphic descriptions of the operations in the field, the difficulties of preparing such an expedition, incidents of the march, and the annoying and unavoidable delays experienced through scarcity of water. The author and Lieut. Ogilvy headed an expedition to locate the scene of Colonel Plunkett's disaster at Gumburra. "No memorial marks the spot in honour of the brave soldiers who fell there, yet they, like many more who die for Britain, have a tomb in the hearts of their comrades, and a memory in the memory of their deeds that is more enduring than stone."

The duties of a medical officer do not appear to have been very severe during the expedition, and Major Jennings spent a good deal of his time satisfying his sporting instincts. That all the officers were keen sportsmen is evident by the

many references throughout the book to the game and birds of the country. The author describes at length the conditions of military service in Abyssinia, the soldiers' dress and equipment, the troops and their mode of fighting, and the folk-lore, industries, religion, characteristics, and customs of the Abyssinians. The Somalis do not come in for much praise, and are described by the author as "a few good, the majority poor to medium, many absolute wasters, and as liars unsurpassed." They have an intense hatred of the Abyssinians, who in turn despise them, and consequently there were continual squabbles between the two races, both in camps and on the march. At the approach of the rainy season, the expedition was ordered back to Berbera, and no time was lost in starting, the return journey being enlivened by big-game shooting.

The book is well and attractively written, the information it contains good, and the matter is beautifully illustrated by nearly seventy fine photo-blocks of more than average interest.

AMERICA.

THE LA PLATA REGION IN THE EIGHTEENTH CENTURY.

'Geografía Física y Esférica de las Provincias del Paraguay y Misiones Guaranícs compuesta por don Felix de Azara, Capitán de Navío de la Real Armada, en la Asunción del Paraguay, 1790.' Royal 8vo, pp. cxxxii. and 478. *With Maps.* Montevideo: Museo Nacional. 1905.

The *Museo Nacional de Montevideo* has recently published an interesting and valuable manuscript existing in the Biblioteca Nacional of Uruguay. It is ably edited and annotated by Señor Rodolfo R. Schuller, who has enriched the volume with voluminous historical, biographical, and bibliographical data, and a comprehensive ethnological essay on the primitive races of Uruguay and the adjoining territory.

It will be remembered that Azara was sent to South America in 1781 as a Spanish commissioner, to determine the limits of the Spanish and Portuguese conquests under the much-vexed and extremely vague Treaty of San Ildefonso. He was an engineer officer of considerable scientific ability. Disgusted with the interminable delays and tergiversations of both nations, he conceived the bold idea to map, at his own expense, extensive areas of the territories indicated in the title to his work above named. He employed thirteen years in his self-imposed task, and, ably seconded by his subordinate officers, explored a vast extent of country traversed by immense rivers and covered by forests and lake districts, and peopled by Indian tribes. Much of the result of his labours was given to the world in the first years of the past century, and no one, in studying the political and natural history, ethnology, and geography of the Plata valley, can afford to neglect the writings of Azara.

The work now before us describes eleven principal voyages of exploration, which include the southern half of Paraguay, the whole of Corrientes and Misiones, north-west Uruguay, the middle sections of the Parana and Uruguay rivers, the lower Paraguay, and an attempt to ascend the Rio Pilcomayo. All of these voyages deal largely with the missions from which the Jesuit fathers were driven some years previously by order of the king of Spain. The latitude and longitude of numerous points were obtained, and served for the mapping of the districts with considerable accuracy.

The first part of Azara's work treats almost entirely of geography, and the data upon which he bases his maps. The second part is a "General Description" of the areas explored. Despite the high repute in which Azara's works are held, they

give frequent evidence of lack of sound judgment and accuracy of observation. For instance, he says, "We may take as dreams what they tell us in Europe about the fertility of these countries. I have gone over the prairies of Buenos Ayres and Montevideo, I have reflected, informed myself, and fully concluded that if these countries could be suddenly populated the same as those of Europe, all the people would die of hunger by the end of ten years, for the lands would not produce *even one for one.*" Either Azara was an unintelligent observer, or he was influenced by the desire of Spain to retard the progress of the Plata valley in the interest of Perú, Panamá, and Cartagena.

He closes his work with interesting and extensive, although frequently doubtful, ethnological data regarding the Charruá, Mbayá, Payaguá, and other tribes, which in early colonial times were the most warlike, brave, and indomitable of any of the Plata valley.

In the archives of Uruguay and the Argentine Republic, there are, no doubt, many extremely valuable manuscripts relating to the history, geography, and ethnology of southern South America. It does great credit to the able and devoted scholars of both of those rising states that they fully comprehend their value, as well as the interest with which the world welcomes their publication.

G. E. Church.

THE MONTHLY RECORD.

EUROPE.

Botanical Geography in Ireland.—The *Scottish Geographical Magazine* has published four vegetation maps of parts of Scotland, whilst the *Geographical Journal* has published the same number of vegetation maps of the Pennines; and it is with great pleasure that one notices that this important work has now secured recognition in Ireland.* The authors, admittedly, were at the outset sceptical as to the value of the work in Britain; and the subsequent adhesion to the movement initiated by the late Mr. Robert Smith of so pronounced a floristic botanist as Mr. Lloyd Praeger is an event in the history of botanical geography. The authors describe and map fourteen vegetation types. Most of these have been found in the districts previously dealt with by the method of botanical survey, but at least two new types are described. These are, a "Racomitrium moor," where a species of moss (*Racomitrium lanuginosum*) shares with the common heather (*Calluna vulgaris*) a claim for dominance; and a "Scirpus moor," where the deer's-hair sedge (*Scirpus cæspitosus*) is occasionally dominant, but oftener shares dominance with the heather. The Eriophorum or cotton-grass moor, is not nearly so extensive in South Dublin as on the Pennines, the Dublin hills being very largely covered with heather moor. In the districts previously surveyed, the lower slopes of the hills have been found to be covered by heath pasture: such situations are marked on the present map as dominated by bracken or gorse. A study of the lists of the plants found in these bracken and gorse associations, however, seems to show that the difference is more apparent than real, and is due, to some extent, to subjective interpretation. Woods are quite rare; and the authors have not found it possible to subdivide the cultivated land into a wheat and a no-wheat region, as has been done on the previous vegetation maps of Britain.

* 'The Vegetation of the District lying South of Dublin.' By George H. Pethybridge and Robert Lloyd Praeger (*Proc. Roy. Irish Acad.*, vol. 25, Section B, No. 6, pp. 124-180, with map and plates).

The authors "decided at the very beginning to avoid reading up the detailed work done in Scotland and England;" and it is possibly due to this truly Hibernian resolution that the authors have failed to understand (see p. 141) the method of compiling the lists of the plant-associations given in the Scottish and English papers. It is greatly to be regretted that the authors have published their map with a brand-new colour scale, making the fourth colour scale for the nine vegetation maps already published! Doubtless each author thinks his own scale the best, but the result is aggravating to students. The paper is written with characteristic Celtic vigour, and the photographic illustrations are excellent. The map is on the scale of 1 inch to the mile, covers about 180 square miles, and is printed by the Ordnance Survey Department.

The Seine-Inférieure.—An article by M. V. Turquan, in the Report of the twenty-fourth session of the Congress of French Geographical Societies (Rouen, 1904), takes stock of the Seine-Inférieure from an agricultural, industrial, commercial, and economic point of view. The article is replete with information, but is not less serviceable to geography for the lesson it conveys of the interdependence of these four branches of the subject, and of the causal dependence of all four on the human geography of the region. A brief account is first given of the general geography of the department, more particularly the economic character of its soil (which may be divided broadly into the pasture land of Bray and the arable land of Caux), and its comparative areas of arable, forest, pasture, and orchard. Well watered by rain and river, and blessed with a mild, moist climate, the land is agriculturally one of the richest departments of France. Its arable land constituted, at the last census, 62·7 per cent. of the whole surface. This is laid out in cereals, potatoes, beetroot, pulse, vegetables, hemp, flax, colza, etc. Forest now occupies 11·7 per cent. of the whole surface, and within the last century has extended its area by 22,000 hectares, due to the conversion of mediocre soil into woodland. Account is taken of the live stock. During the last forty years there has been a decrease in the number of horses, and the flocks of sheep have shrunk to half their strength. There is a large industry in milk, amounting to the yearly value of fully 1½ million pounds, carried on principally in the Neufchâtel arrondissement, but the butter and cheese of the Gournay district are also in universal esteem. Poultry and bees are also largely kept. The paper treats of the subdivision of the agricultural population into working proprietors, farmers, métayers, etc.; the sizes of the holdings, prices of land, farm-rents, etc. The farms of the Caux region are mostly 60 to 80 hectares in size. The use of agricultural machinery is widespread, and each arrondissement has its agricultural societies. There is also a departmental Chair of Agriculture, a practical school at Aumale, and an agronomic station at Rouen. Lastly, for purposes of comparison, a general view is given of farming industries in the whole of France.

Scientific Study of the Lagoon of Venice.—We are informed by the 'Reale Istituto Veneto di Scienze Lettere ed Arti' that it has been decided to undertake a systematic study of the geophysical phenomena which, directly or indirectly, concern the lagoon of Venice. A special committee has been appointed for the purpose, and preliminary investigations on the subject of the tidal waves of the upper Adriatic, and the rivers flowing into it and the lagoon of Venice, have been set on foot. They have been placed in charge of Dr. G. P. Magrini, who will be assisted by Profs. L. de Marchi and T. Gnesotto of the University of Padua. Valuable and interesting results may be anticipated from these researches.

The Northern Urals.—Profs. Duparc and Pearce, whose researches have added so much to our knowledge of the physical geography of the Ural range, describe, in the December number of *La Géographie*, the remarkable series of

terraces which they have brought to light on the slopes of the northern part of the range. This is composed of several parallel ridges running for long distances almost due north and south, the most important, which form the European-Asiatic water-parting, being the Poyassovoi Kamen, composed entirely of quartzites, which also appear to be the main constituents of the secondary chains, such as the Liampovsky Kamen and the Kvarkush. All these ranges display the terrace-formation (some hints of which had previously been noted by the authors in the more central parts of the Urals) in its most characteristic form. The crests form plateaus which extend longitudinally with the greatest regularity, while the more elevated summits rise here and there in the form of truncated cones or a succession of level steps. Minor terraces are to be traced on the slopes of the ridges and summits, and an accordance of level may often be noticed over great distances. The phenomenon is so general that there can be no doubt that it represents the vestige of a former topography, the age of which it is difficult to determine, though it may be confidently stated that it was older than the existing quarternary valleys, with which the terraces bear no direct relation. The fact that the terraces become more and more marked in the northern parts of the range may be ascribed to the greater development, in this direction, of the quartzites above alluded to; for these rocks, being more refractory than most to atmospheric denudation, have no doubt preserved the old relief to a greater extent than the other formations represented in the range.

ASIA.

Agriculture in Cyprus.—A report by Prof. Wyndham Dunstan on the agricultural resources of Cyprus, especially its cotton cultivation, was issued as a Parliamentary paper in September, 1905. A glance at its past history shows the contrast between the 7–15,000,000 lbs. of cotton the island produced under Venetian, and the 1,000,000 lbs. under British, occupation. On a rough calculation, only 4000 acres at most are now under cotton cultivation against 60,000 acres in Venetian times for export, and another 60,000 for local manufacture. Two kinds of cotton are produced—"dry" cotton (grown without watering), and "wet" cotton (grown on irrigated land), of better quality and higher price. The average yield is far higher in Cyprus than in America, often reaching that of Egypt. Most is exported, but an appreciable quantity is woven into native cloth. The climate and soil are particularly well adapted for cotton-growing, while the Cypriot is a born agriculturalist, and specially a cotton-grower. Native labour is readily obtainable, and outside labour, if wanted, is to be had from the neighbouring coasts. The chief climatic drawback is want of rain, particularly in the initial stages of growth, necessitating resort to artificial watering. For the extension of cotton cultivation and its export to this country, the main needs are—(1) an effective system of irrigation; (2) an agricultural department qualified and equipped to conduct systematic experiments with a view to improvement of cotton culture, and supply of information and advice to native cultivators; (3) shipping facilities, and especially a direct service to England with low freight rates. In the matter of irrigation the Government has in recent years spent £60,000 in irrigation works, with results hitherto disappointing. Prof. Dunstan sees no reason why the "shadoof," so successful in Egypt, should not be tried in Cyprus. Artesian wells might, in his opinion, go a long way to solve the water problem in Mesaoria. He points how, in Venetian times, the needed supply of water was drawn chiefly from wells sunk by the natives. In view, too, of the treeless state of a large area, the judicious planting of trees should be vigorously prosecuted. As to the second want, Prof. Dunstan gives in a separate memorandum (No. 2) his detailed scheme for the organization of an Agricultural Department. Its labours would include investigation into the

composition of the soils of Cyprus, and the use of artificial manures; cultivation of cereal, root, and fodder crops; cotton, fruit, and vegetables; grapes and olives and aromatic oil plants; liquorice, tobacco, etc. The question of these various cultures is treated in a summary manner.

Settlements in Ancient Palestine.—With the support of the Imperial Academy of Sciences, the Ministry of Instruction, and private assistance, Dr. Ernst Sellin, Professor of Old-Testament Exegesis and Biblical Archæology in the Evangelical Theological Faculty in Vienna, conducted excavations in northern Palestine in 1902, 1903, and 1904. The rich results obtained are not without geographical interest. Taught by the experience of the English and German explorations, the Austrian investigator at once, from the beginning, applied his energies to one of those wide plains distant from Jerusalem where his predecessors had first struck on important finds. Here lie heaped the mounds constituting a typical feature of the historic landscape of the Near East—the so-called "tells." In them (as in the excavation of ancient Ilium) are found the ruins of towns piled successively one on the other throughout a period of thousands of years. Dr. Sellin selected the Tell Ta'annagh, one of the largest mounds, as much as 1115 feet long by 525 feet wide, and 130 to 160 feet high, situated in the great battle-plain of the land, the plain of Megiddo. It lies south-east of Haifa, on the south side of the railway line. Through this plain the caravan-route from Babylon to Egypt ran from the earliest times. The present name of the tell commemorates the ancient name of the town of Ta'annach, a town mentioned in Egyptian inscriptions of 1500 B.C. figuring in the Bible as the seat of a Canaanite king, and afterwards as having been taken in possession by the Israelites. The name vanishes at a comparatively early time out of literature. Dr. Sellin's excavations have established the fact that on the hill of Ta'annach there stood until crusading times an Arabian town with castle. In the hundred to two hundred years of its existence, it developed quite a considerable culture. Destroyed by the Crusaders, the place has since lain a neglected ruin. In an earlier period, in the time of the Romans, there was no settlement on the hill itself, but a place at the foot of the hill then bore the ancient name. The Romans were wont to utilize hills as sites for citadels, and to turn the plains to account as settlements. Fortification of the place was, however, superfluous, seeing that one hour to the west there lay the strongly fortified Legio, and four hours to the east arose Scythopolis—strongholds sufficient for protection of the plains. Nor in the Greek age, about 400 B.C., was the hill itself occupied. On the contrary, the town itself must have been totally destroyed when Greek influence began to assert itself. Provisionally, the time for that event can be taken only as between 722 and 500 B.C. This old town was founded, about 2000 B.C., by the Canaanites (Amorites), known as a people of culture, who, between 2500 and 2000 B.C., took possession of all Palestine. Between 2000 and 1600, the town received some cultural influences from Babylon and Egypt, and after this, absorbing Phœnician and Ægean elements of culture, it made a remarkable advance. This advance came to a sudden end when, under Thutmosis, or about 1500 B.C., the Egyptians plundered the town with its west citadel built in this flourishing Canaanite period. Till 1300 the town stood under Egyptian supremacy; clay houses marking this period of culture. Down to 1000 Israelitish influence gradually penetrated. The possession of the land by the Israelites is denoted by no sharply defined section in its culture. There was rather a process of assimilation lasting several centuries. Not till 1000 begins the classic Israelitish period. Solomon is, indeed, to be taken as the builder of the east citadel with the east fort. A town then needed strongholds outside its pale proper. After the partition (about 950 B.C.) of the Israelitish kingdom, the cultural centre of gravity lay, not in the old Judaic

kingdom, but in the northern kingdom of Israel, the so-called Kingdom of the Ten Tribes, to which belonged the towns of Megiddo, Ta'annach, etc. After this, down to 800, the Babylonian influence seems to have entirely vanished, there remaining the Canaanite-Phœnician, the Egyptian, and especially the Cypriot influence. Then begins the period of the gradually penetrating Greek culture. The town had attained its maximum extension; then came its destruction, perhaps at the hands of the Egyptians, perhaps of the Scythians. Thereupon, in the course of 1500 years, storm and rain deposited over all the ruins a layer of earth 7 to 13 feet thick, on which the Arabians were free to build their town.

Region of the Poyang Lake, Central China.—An instructive report on a recent voyage on the Poyang lake and its main feeder the Kan, carried out by Mr. Consul Clennell on board a British gunboat, was issued as a Parliamentary paper in December last. The region in question is, of course, fairly well known to Europeans, but none the less will Mr. Clennell's descriptions serve in many ways to correct erroneous ideas, while his account of the hydrographical system of the Poyang lake and the nature of the surrounding region is perhaps the clearest that has yet been given. The voyage was the outcome of negotiations with the Chinese authorities, with a view to establishing the right of foreign war-ships to navigate the Poyang lake, and the first part of the voyage was made by H.M.S. *Astræa*, accompanied by the gunboats *Kinsha*, *Teal*, and *Snipe*. Everywhere the reception seems to have been quite cordial, no indication being observable that the visit was in any way unwelcome. The Poyang lake consists of two sections of very different character, the shores being abrupt towards the north, while further south the lake spreads with no fixed limits over a wide level plain. Mr. Clennell points out that in the northern section there are deep bays masked (especially on the east) by intervening headlands, so that their extent has not, perhaps, been realized by previous visitors. To the west the land rises in the Lushan group of mountains to heights of 4000 and 5000 feet. The Lushan seems to be almost entirely volcanic, and, like the Hsishan further south, to have no immediate relation to the general geology of the neighbouring country, which consists, where not an alluvial or sandy plain, of red sandstone with no sharp relief. Both the mountain groups above mentioned give place westward to lower ground, while south of the barrier which separates the basin of the Poyang from the Yangtse, the country is for a long way of very slight elevation. The mapping of the lake is almost an impossibility, owing to the great and sudden changes of water-level and the enormous areas of level ground thus inundated. The currents also cannot be depended upon, as their direction may be entirely altered as the result of local rainfall. The town of Wuchŭng occupies a favourable position on an island or peninsula between the mouths of the Kan and Hsiu rivers, and is described as a prosperous commercial town of probably six times the population of Nankang, which, though but a ruinous village, is marked in most maps in large capitals. On the upper Hsiu river is Wu Ning, an important centre of tea cultivation, while the chief commercial centre of the lower basin is Tu Chia Pu. The published maps of this region are said to be all incorrect. The Kan river was ascended 60 miles beyond Nanchang, which is not only the largest city in Kiangsi, but, from a Chinese standard, a very fine town. It is incorrect to describe it as on the southern shore of the Poyang lake, as many miles of delta intervene. The country is intersected by innumerable channels, and existing maps are very incorrect. The main stream of the Kan appears to be navigable, under favourable conditions, for a great distance, though long delays might have to be encountered. A British steamer and two launches have lately begun to ply between Kiukiang on the Yangtse and the mouth of the Kan. Opposite Chang-shu, which formed the turning-point, the

Yuan-chou river enters, draining a rich mineral region, but not available for steam traffic. The latter part of the report, in regard to which limits of space forbid us to enter into details, describes Mr. Clennell's junk voyage across the eastern basin of the lake to Jao-chou, and an overland journey to the important porcelain works of Chingte Chün. This town, which during the busy season has a population of about 400,000, recalled the poorer parts of Manchester rather than anything Chinese.

Dr. Tafel's Geological Researches in Northern China.—The journey to which reference was made in the December number led from south to north along the whole meridional section of the Hwang-ho's course between the provinces of Shensi and Shansi. The region has rarely been visited by scientific travellers, and Dr. Tafel's observations will shed much new light on the physical history of the region.* While ascending the valley of the Hwang-ho (which he did by land throughout), Dr. Tafel was able to make a careful study of the escarpment of the Ordos-Shensi tableland, which runs from north-east to south-west and west, and falls abruptly into the trough of the valleys of the Wei-ho and Fwen-ho. The tableland is composed of upper Carboniferous sandstone, covered by the red clays of the so-called Gobi formation, and its escarpment is masked to some extent by the deposits of loess through which the Hwang-ho flows. It is pierced at Lung-moen by that river, the valley of which is of much more recent date than the trough above alluded to, into which it descends from its higher level. Between Tung-kwan (at the great elbow of the Hwang-ho) and the gorge by which it pierces the escarpment the river is wide and shallow, and though ferries exist in this section, the passage of the river by them is a tedious process, often occupying one and a half to two days. Hence the importance of the route across the river at Tung-kwan. At the gorge the river narrows to some 40 yards, and it seems incredible to the traveller approaching it that such a stream can possibly make its exit from the mountain wall confronting him. The saying that the great Emperor Yu cut a way for the stream with his sword gives an apt notion of the nature of the passage. A little north of Lung-moen Dr. Tafel discovered a mass of granite, of recent date, of which there had been no trace further south, while at Hu-kou, where the river crosses a harder bed of the Carboniferous sandstone, it forms a distinct fall, the existence of which does not seem to have been known to geographers. The water drops some 30 feet into a narrow fissure only 70 yards wide, the depth of which, according to native ideas, is unfathomable. Between Lung-moen and Hu-kou the river freezes (though this is not the case either above or below this section) and forms a natural bridge, of which use is made especially for the transport of coal, which is mined at various points on the Shensi-Ordos escarpment. North of Hu-kou the traces of wind-erosion became very manifest, and the loess deposits were sensibly smaller. About here a few isolated summits were seen rising above the uninteresting expanse of the sandstone, and a neighbouring part of Shensi has been deeply eroded by streams. On reaching Wu-bau-hsien, the rainless conditions prevailing further south ceased, and imposing villages were seen. Wu-bau is noted as supplying a large proportion of the boats used on the Hwang-ho. Owing to the rapidity of the current, the upward traffic is small compared with the downward. Dr. Tafel reckons that in 1904 the flood-water took only five or six days to reach Lung-moen from Lan-chou-fu, though, if this is the case, it is difficult to understand how its temperature is raised to the extent it is. The volume does not seem diminished by evaporation in the interval, in spite of the unimportant nature of

* The same section of the river has lately been visited by two other expeditions—firstly, that of Count von Mutius; and secondly, that of Major MacAndrews and a party of English officers engaged on a survey.

the tributaries received. Dr. Tafel made an excursion westward across the Great Wall, and afterwards made his way north to Kwei-hoa-cheng. He hoped to traverse the Ordos country and Alashan, and to reach Lan-chou-fu by the beginning of last November. He concludes with a few notes on the meteorological conditions in the regions traversed.

German Archæological Expedition to Chinese Turkestan.—In consequence of the archæological discoveries made by Professor Grunwedel at Turfan (Eastern Turkestan) in 1903, the German Government sent an expedition to the same place in the following year under the direction of Dr. A. von Lecoq, of the Royal Prussian Ethnological Museum. Dr. von Lecoq, assisted by Herr Bartus, arrived at Chugutchak in October, 1904, and thence travelled to Kara Khoja (Dakiyanos), in the vicinity of Turfan, remaining there nine months, and excavating a number of caves and stupas. The finds have been most abundant, some hundred boxes of antiquities having been sent to Europe. These antiquities consist of heads of statues, showing Greek and Indian influence, well-preserved wall paintings from ruined temples, coins, and a large quantity of manuscripts in no less than seven kinds of writings, namely, Uigur, Brahmi, Tibetan, Kük Turki, Manichæan (some manuscripts illuminated), Syriac, and Chinese. Dr. von. Lecoq and Herr Bartus left Turfan for Kashgar in October last, and at Kashgar they have been joined by Prof. Grünwedel and Herr Phurt, who have arrived from Berlin *viâ* Russian Turkestan. The party are now preparing to go to Kuchar, where systematic excavations are to be undertaken.

AFRICA.

Opening of the Nile-Red Sea Railway.—This important undertaking, the necessity of which for the commercial development of the Sudan has long been recognized, and which has been quietly and unostentatiously carried into execution during the past few years, was formally opened by Lord Cromer on January 27. The Red sea terminus is at Sheikh Barghut, a spot a few miles north of Suakin, which offers better facilities as a port than any other on this coast, and has been renamed Port Sudan. As is well known, the track runs in great part over a waterless desert, involving unusual difficulties in the way of construction, and the successful accomplishment of the task is a piece of work on which all concerned deserve hearty congratulation. Other extensions of the Sudan railway system are proposed.

M. de Rothschild's Journeys in East Africa.—The *Comptes Rendus* of the Paris Academy of Sciences for December 11 last contain a note by M. Maurice de Rothschild on journeys of zoological research carried out by him in East Africa, which are also of interest geographically, as they led in part over little-known ground. The traveller first landed at Jibuti, making his way to Addis Abbaba, and thence visiting the Soddo country; the return being effected by the Hawash and the Assabot mountains. Lieut. Chollet, who with D. H. Neuville accompanied him on this part of the route, made a map of the region traversed, paying especial attention to the upper course of the Hawash. A nine months' trip in British East Africa was afterwards made in company with Dr. J. Roger. From Mombasa the travellers took the route *viâ* the rift-valley to Baringo, thence crossing the Laikipia and Lorogi ranges * and the Barta steppe, into the Rendile country, through which they made their way to Lake Rudolf. The zoological results of this journey have been very successful. Besides a specimen or specimens of the five-horned giraffe, M. de Rothschild secured several of the newly discovered

* Lorogi is described by Mr. Hobley (*Journal*, vol. **25**, p. 294) as a "tabular mass."

Hylochœrus, or forest-pig, representing the animal at various ages. They were obtained in the densest part of the Nandi forest, and the skeletons brought home will permit of the differences from *Potamochœrus* and *Phacochœrus* being laid down with greater precision than hitherto. The collections include the skin and skeleton of the little-known *Boöcercus* (*Tragelaphus*) *euryceros*; the skin of an elephant from Lake Rudolf differing in some respects from other African varieties; and, in particular, a remarkable tusk, which it is difficult to assign to any known animal. It measures 2 feet 4 inches along the curve, and bears certain resemblances to the tusk of an elephant, as also to one of the lower canines of a hippopotamus, which might be supposed to have grown abnormally owing to the absence of the opposing canine of the upper jaw. The mode of insertion, however, and the absence of enamel, are points of divergence from the latter.

Minimum Temperatures in Tropical Africa.—Thanks to the labours of observers in many parts of Tropical Africa, the results of which have been made accessible in the Reports of the British Association, the *Mitteilungen aus den Deutschen Schutzgebieten*, and elsewhere, there now exists a sufficiently large body of data to permit of useful generalizations regarding the climatic features of Tropical Africa. Comparatively little has yet been done in the way of tracing the general laws of climatic distribution deducible from those data, but an interesting attempt in this direction, in regard to one particular feature, has lately been made by Dr. J. Hoffmann, in a series of articles contributed to *Petermanns Mitteilungen* (1905, Nos. 4–7). Dr. Hoffmann has chosen the temperature minima as the subject of investigation, and this is of much interest by reason of the special factors (greater rarity of the air, strong radiation during the twelve-hours' night, etc.) which may bring about a degree of cold sufficient to give rise to unpleasant sensations even on the equator. The area dealt with is the south equatorial region (more particularly the elevated plateau lands of East Africa), and the author discusses the principal subdivisions in turn, tracing the effect on temperature minima and their distribution through the year of such factors as elevation, distance from the sea, rainfall, winds, etc. At the conclusion of the series an attempt is made to deduce the general laws affecting the distribution of the minima. In the horizontal direction the values, as might be expected, diminish with the distance from the coast and the increase of latitude. The altitudinal variation can be brought under no such simple rule, the regular decrease of the values with the altitude being affected by many disturbing factors. The facts are different, *e.g.*, for places situated in a mountain range, on a plateau, or on the slope of an isolated peak rising from a plain; the general law holding good least of all in the case of a mountain region cut up by valleys. Humidity and cloudiness are likewise important disturbing influences, as is well shown by the fact that the minimum of 4° C. (39·2° Fahr.), observed at 1120 metres (3675 feet) in the neighbourhood of Ruwenzori, has never yet been recorded up to a height of 1900 metres (6230 feet) on Kilimanjaro. The important question, from the point of view of agriculture, of the distribution of night frosts, is also considered, and the author concludes that near the equator we have no evidence of actual frost at a lower altitude than 2000 metres (6560 feet), though cold nights with a temperature approaching the freezing-point are not uncommon.

Exploration in the Kamerun.—In the *Deutsches Kolonialblatt* (vol. **16**, No. 17), there is a report by Captain Dominik of an expedition carried out by him into the Bapea country, Kamerun. On January 17, 1905, with 70 coloured soldiers and 50 Bali auxiliaries, Captain Dominik was posted by Balinga ferry on the right bank of the Mbam, ready to start on an expedition to Bapealand. This territory extends some 400 square miles between the Mbam (Sanaga), Bakoko, and Captain Schimmelpfennig's route from Mbam to Yabassi, and has hitherto been almost entirely

unknown. The immediate object of the expedition was to chastise the Bapeas for injuries done by them to the peaceful Yambassas. Sending the caravan by way of Ateba, Captain Dominik, in a canoe, with four Sierra Leone expert watermen, piloted his way from the Nachtigal falls down to the mouth of the Mbam. Below the falls, where, between three islands, the river plunges some 80 feet, the Sanaga is more than 500 yards broad, not deep, but rapid; on one side a dark strip of primeval forest, on the other an undulating grass steppe, with the Mangissa mountains in view to the west. After receiving the Mfamba, the Sanaga is 2½ to 3 miles broad. Everywhere the river abounds in hippopotamus. In the middle of Bapealand the people had not so much as heard of the white man. At the mouth of the Mbam is a strong Haussa settlement, while from the Mbam inland to Siondo is an undulating grassy plain. On February 3 the expedition entered a cultivated plain, where as far as the eye could pierce, up to the bare mountains whose crests were relieved by some oil palms, all was cultivated with the most painstaking industry. The report includes altogether an interesting and fairly detailed account of the land and its inhabitants. Bapea is a region remarkably rich in oil palms, and is densely inhabited by a people of industrious habits. This is an item of no little importance in the Kamerun, in which the success of the plantations, inland trade, and industrial enterprise is all dependent on the labour question. Bapea was further found to have all the conditions requisite for cotton culture, enjoying as it does a longer period of dry weather than the woodland districts of the Yaunde region.

AUSTRALASIA AND PACIFIC ISLANDS.

The British Solomon Islands Protectorate.—Mr. C. M. Woodford's recent report on the British Solomon islands (Colonial Reports, Annual No. 461, 1905) covers a period of two years, 1903–1905, and records for this period a satisfactory increase in trade. During the twelve months ending March 31, 1905, the total trade of the protectorate amounted to £81,061, the exports being valued at £47,405, and imports at £33,656. The whole trade of the protectorate is exclusively done with Sydney, and is shown to compare favourably with the trade between New South Wales and other countries, British and foreign. A direct steamer service to and from the Solomons from Sydney *viâ* Brisbane six times a year commenced from January, 1905. Copra is still the chief article of export, and this, with other exports, on reaching Sydney, is largely re-exported to Europe. A decline is noticeable in the prices offered for pearl shell and other shells, while the quantity of turtle shell shipped has been satisfactory. The coconut-planting industry, by white men, has been largely extended during the period under notice, the area under cultivation having reached 3423 acres. An attempt is now being made to grow cotton, and rubber-growing will shortly be tried, while rice has been successfully grown experimentally. The annual average rainfall at Tulagi for the past seven years (1898 to 1904) was 127·026 inches. Attention is directed to the need of further hydrographical work in the Solomons, more especially between the islands of Guadalcanar and Florida, the most frequented waters of the whole group; a coastal survey of the island of Mala appears to be also greatly needed. The white and foreign population of the protectorate on March 31, 1905, numbered 110, while the native population, roughly estimated, numbers about 150,000.

GENERAL.

The Association of American Geographers.—We are informed that the second annual meeting of the association of the American Geographers was held in New York City, December 26–27, 1905, under the presidency of Prof. W. M. Davis,

of Harvard University, the annual dinner being held at the Hotel Endicott on the evening of December 26. The several phases of geography, particularly the organic, physiographic, and educational, were well represented. About twenty-five papers were read by their authors, and others were read by title. About forty members and invited speakers were present. The association does not sustain any regular publication, but, through the courtesy of the American Geographical Society, the bulletin of that body for February of this year will be mainly devoted to the proceedings of the meeting. The president for 1906 is Mr. Cyrus C. Adams, and the secretary and treasurer, Prof. Albert P. Brigham.

A Photographic Pocket-book.—The 1906 edition of 'Wellcome's Exposure Record and Diary' has just been published by Messrs Burroughs Wellcome & Co. In all important features it is similar to the last edition, but it has been brought up to date. The speed table has received special attention, and a list of English, Continental, and American plates and films has been supplied, giving the latest speeds to be used with Wellcome's Exposure Calculator. As in the 1905 edition, the monthly light tables face the mechanical calculator affixed to the inside of the cover. These light tables, printed on perforated leaves, are so arranged that as each month goes by the corresponding leaf can be removed, disclosing the table for the coming month. There are, as usual, two editions of the book, one for the northern hemisphere and one for the tropics and southern hemisphere. Both are in one style of binding, and published at 1s.

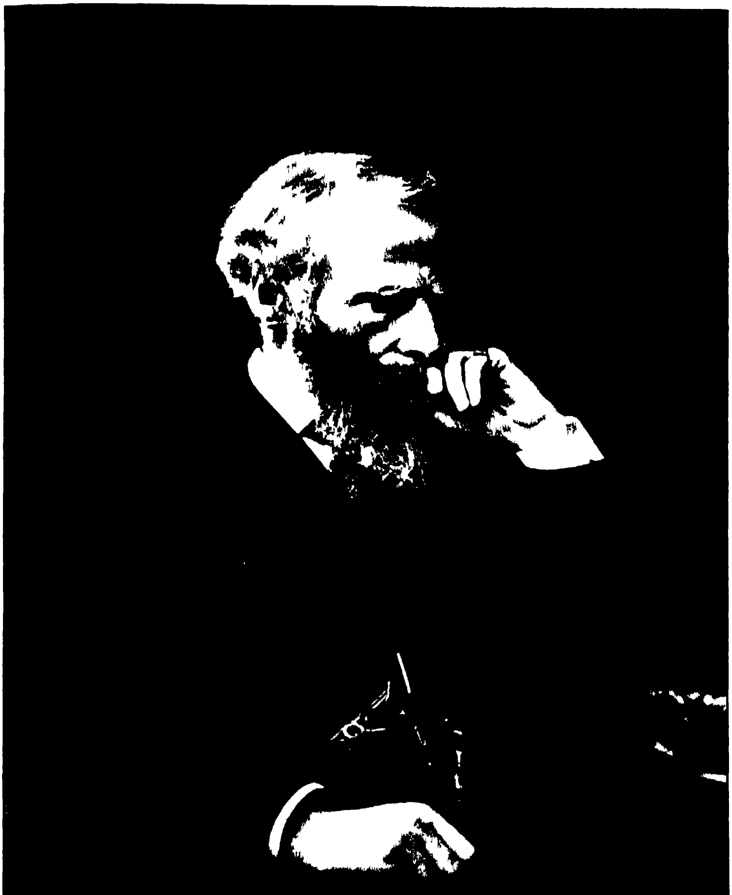
OBITUARY.

Right Hon. Sir Mountstuart E. Grant Duff, P.C., G.C.S.I., F.R.S.

If the available space in our Society's *Journal* permitted any approach to an adequate account of the life of Sir Mountstuart Grant Duff, that task could not, without presumption, be undertaken by one of almost a younger generation, who had not the advantage of knowing him during his parliamentary career. But it can hardly be doubted that before long the memoir of so widely known a personality will be written by some competent hand, and I am unable to resist the view that this brief obituary of one of the most intellectual and cultured of our former presidents should be undertaken by the present occupant of his chair.

Mountstuart Elphinstone Grant Duff, who died on January 12, at the age of nearly seventy-seven, was born in February, 1829. The son of an active and well-known Indian official, who had been Resident at Sattara, he may be said to have inherited an interest in the great dependency with which he was afterwards so closely connected. He was educated at Balliol College, Oxford, where he graduated in 1850, and he was called to the Bar at the Inner Temple in 1854, having obtained a certificate of honour and a studentship in the previous year. Unfortunately, while at Balliol his eyes went seriously wrong, and for the rest of his life he had to work largely with the eyes of others.

With his vivid and alert nature, it was inevitable that he should enter political life, where he could give the fullest satisfaction to his craving to be always in close touch with the social and international problems of his time, as well as with the individuals, in various departments of art and science, who were making history. For he practised to the utmost Pope's dictum, that the proper study of mankind is man; although this did not preclude him from other interests, of which perhaps



The Right Hon. Sir Mountstuart E. Grant Duff,
P.C. G.C.S.I. C.I.E. &c.

the keenest and most enduring was his love of botany. For nearly a quarter of a century, without a break, he represented the Elgin Burghs in Parliament. He served as Under-Secretary of State for India—the country of his predilection—from 1868 to 1874, when the Gladstone ministry fell. He also served as Under-Secretary of State for the Colonies from 1880 until, in 1881, he accepted the governorship of the Madras Presidency.

His knowledge of foreign affairs was probably unsurpassed by any of our countrymen of that period. He not only brought to their study the philosophic mind, the keen perception, and the patient industry which remained unimpaired to his last days, but he devoted the recesses of Parliament to travels on the continent, where he could utilize his social tastes and his remarkable capacity for noting and remembering the opinions of men and women who exercised any material influence on the course of European progress. His annual addresses to his constituents, known as the "Elgin Addresses," were always reproduced by the Press, and were regarded throughout the country as valuable contributions to the knowledge of continental politics. They have still a living interest for those whose inevitable gap between school history and personal knowledge extends from the Crimean war to the Franco-German war. Of the same period and of equal value were two of his works, entitled 'Studies in European Politics,' and 'A Political Survey.' The latter, treating largely of outlying countries, of which, in the sixties, our knowledge was very different from that of to-day, has a strange old-world interest to the reader in the twentieth century.

During the period 1874–80, Mr. Grant Duff produced several works. One of the best known is his 'Miscellanies, Political and Literary' (1878), which includes a specially fine and just estimate of Castelar, beyond question the greatest orator of our time. But Mr. Grant Duff's most delightful book of that period was his 'Notes of an Indian Journey'—a voyage of several months which he undertook immediately on his quitting the India Office in 1874. His pleasure in freedom from the trammels of office and in visiting the country to which his mind had so often turned, breaks out on every page of these 'Notes,' which testify to a *joie de vivre* in the gorgeous East that must have played a considerable part, six years later, in determining him to abandon parliamentary life to become "a providence" for the teeming millions of the Madras Presidency.

The five years (1881-1886) that he spent there as governor were probably the happiest in his life. They were certainly the fullest, as he was untiring in travelling over his Presidency, making himself acquainted with the needs of the people. His administration has always been admitted to have been most successful, and his official minutes are excellent reading, as he issued full reviews of everything done by him for the information of his successors. Yet he found time for much private enjoyment, as he showed in an address delivered before the Society of Arts in February, 1898, entitled 'Recreations of an Indian Official.' In this he characteristically quotes Goethe's saying, "Time is endlessly long, and every day is a vat into which a great deal may be poured if you will only fill it up." Much of the 'Recreations' is occupied with observations on the fauna and flora of his Presidency.

After his return home, he divided his energies between literature and the care of various learned societies. His most attractive book of this period was 'Ernest Rénan' (1893), in which the charm of the great Frenchman seems to have fallen as a mantle on his biographer. Other Memoirs were those of Sir H. S. Maine and Lord de Tabley. The editing of a very full Victorian Anthology occupied considerable time, but was a labour of love. Probably, however, to the general public of to-day, Sir Mountstuart Grant Duff is most intimately known through

his 'Out of the Past' and his 'Notes from a Diary,' the former of which he described "as supplementary to" the latter.

His diary covers a period of half a century, from 1851 up to and including the first meeting of the Privy Council on the morning after the decease of Queen Victoria. With the exception of this historic gathering on the accession of His Majesty, the author carefully excludes from these volumes the official and graver side of his life, and they consequently form an admirable mirror to the opinions and *obiter dicta* of a mass of celebrities during their hours of relaxation. Sir Mountstuart's accuracy of memory and care of detail have given a value to this *olla podrida* of personal reminiscences, which is heightened by the wit and subtlety of the author himself. Accuracy was, indeed, the very breath of his nostrils. In the 'Notes,' he quotes the following passage from Mr. J. A. Froude's legend of St. Neots: "We all write legends. This does not arise from any wish to leave a false impression—scarcely from carelessness—but only because facts refuse to remain bare and isolated in our memory. Facts are thus perpetually, so to say, becoming unfixed and rearranged in a more conceptional order;" to which Sir Mountstuart adds, "It would be difficult to put more distinctly the way in which we should *not* deal with facts." This absolute accuracy of statement added incalculably to the charm of Sir Mountstuart's conversation. His apt references to some bygone facts or sayings were always clear-cut and convincing, while they sparkled with wit and delicate humour.

To deal briefly with his connection with learned bodies—he had been in his earlier days Lord Rector of the Aberdeen University; he became a member of the Senate of the University of London in 1891; he was President of the Royal Historical Society from 1892 to 1899; he was the King's trustee of the British Museum from 1903; and, finally, he was President of our Society from 1889 to 1893. He retired owing to a difference of opinion amongst our Fellows as to the advisability of admitting lady travellers to Fellowship in the Society. His presidency was marked by great energy and ability, while his public addresses were always of deep interest. At the conclusion of one of these, his predecessor—the late Lord Aberdare, himself a man of high culture and intellect—struck the keynote of Sir Mountstuart's power. He said, "To those who can read between the lines, almost every paragraph of the address shows a man who has spent his life in the constant acquisition of various knowledge." Sir Mountstuart was keenly alive to the necessity of more time being given in schools to the study of history and geography, "those twin brethren, Castor and Pollux." In one of his addresses to us (June, 1892), he said, "Put composition in the ancient tongues, as a piece of regular school business, behind the fire," and he added that there would then be "time to read a great deal more of the classics than there is now, and to teach as much history and geography as any one wishes to teach a boy under eighteen or nineteen." He continued to the last to watch with interest the growth of geographical knowledge. On his death, he had been a Fellow of our Society for forty-five years.

Following the practice of our *Journal*, this obituary must be confined to Sir Mountstuart Grant Duff's public life; but his large circle of friends know that, well filled as that public life was, he displayed his greatness of soul and his personal charm no less consistently in his private life, to which it was an honour to be admitted. Although he was not one of those who "suffer fools gladly," his essentially kind nature displayed itself both in personal intercourse and in his writings, and perhaps his most appropriate epitaph would be the quotation from Rénan which he selected as a preface to his Notes from a Diary: "On ne doit jamais écrire que de ce qu'on aime. L'oubli et le silence sont la punition qu'on inflige à ce qu'on a trouvé laid ou commun dans la promenade à travers la vie."

GEORGE TAUBMAN GOLDIE.

Admiral Lindesay Brine.

The Society has lost a Fellow of just fifty years' standing in the person of Admiral Lindesay Brine, who died at Torquay on February 2, in his seventy-second year. Entering the navy in 1847, he served in the *Leander* in 1854, during the operations in the Black sea, and five years later did good work in China during the war of 1859–60, being in command of the *Opossum* at the capture of the Peiho forts in the latter year. While serving in the Far East, he took much pains to collect accurate information on the troubles then prevailing, and in 1862 published the results of his observations and inquiries in a volume entitled 'The Taeping Rebellion in China.' In 1870 he travelled extensively in Central America, visiting many of the sites of ancient cities made known to the world by Mr. J. L. Stephens, besides studying with much care the populations and general conditions of some of the least-known regions of Guatemala, which he crossed from the Pacific to the Atlantic. In 1872 he read a paper before the Society on "The ruined cities of Central America," which was printed in the *Journal* for that year, while in 1894 he brought out a detailed account of his researches under the title, 'Travels amongst American Indians.' Admiral Brine was also engaged in operations for the suppression of the slave trade on the African coasts, and took part in Sir D. Forsyth's mission to Mandalay in 1875. He had served for some years on the Council of the Society—in 1886–89, and again in 1893–94.

The Rev. James Stewart, D.D., LL.D.

We regret to record the death, on December 21, 1905, of the Rev. James Stewart, commonly known as "Stewart of Lovedale," from the spot in South Africa where the best part of his life's work was accomplished. Dr. Stewart will long be remembered as the man who above all others contributed to the education and civilization of the South African races through the splendid work done at Lovedale, founded in 1824 by missionaries of the Glasgow Missionary Society, and which, since being placed under his charge in 1866, has developed into the most important institution of its kind in the whole of South Africa, capable of supplying a thoroughly practical education to one thousand boys and girls, gathered from no fewer than fifteen distinct tribes. Dr. Stewart was born at Edinburgh in 1831, and, after travelling extensively in Europe and South America, became known to geographers for the visit of inspection which he paid to the Zambezi during Dr. Livingstone's second expedition to that river, with a view to the establishment of an industrial mission on the shores of Lake Nyasa. Although his decision was at the time unfavourable, the idea bore fruit eventually, for, returning to Lake Nyasa in 1875, he took part in the launch of the first steamer, the *Ilala*, on its waters, and succeeded in establishing the flourishing Livingstonia mission. At the time of his death he was engaged in elaborating a scheme for a college, which should supply a thoroughly sound "higher education" to the natives of South Africa. Dr. Stewart was a life Fellow of the Society, having joined it forty years ago.

James Bonwick.

Mr. James Bonwick, the well-known writer on topics connected with the history of Australasia, died at Southwick, Sussex, on February 6, at the advanced age of eighty-eight years. Mr. Bonwick, who was born in London, though of a Sussex family, emigrated to Tasmania in 1841, being one of the earliest settlers. In this and other of the Australasian colonies he spent many years of active life, devoted

to a variety of pursuits, and materially adding by his writings to our knowledge of that part of the British Empire. Returning to this country in 1884, he eventually became archivist to the Government of New South Wales, and was actively engaged until 1902 in the preparation of an official history of that colony. Among his other works, we may mention 'The Last of the Tasmanians' and 'Daily Life and Origin of the Tasmanians' (both published in 1870); 'The British Colonies and their Resources,' 4 parts (1886); 'First Twenty Years of Australia' (1882); and 'The Port Philip Settlement' (1883). He also discussed questions concerning the voyages of Captain Cook. Mr. Bonwick became a Fellow of the R.G.S. in 1865.

CORRESPONDENCE.

Currents in the Arctic Ocean.

U.S. Coast and Geodetic Survey,
Washington, D.C., U.S.A., January 25, 1906.

UPON p. 5 of the present volume of your magazine there is an implication that I have considered the currents passing through Bering strait to be of great importance in the circulation of the Arctic ocean. A perusal of the paper there referred to, or of the slightly extended version of this paper found in the 'Report of the Eighth International Geographic Congress' (p. 397), will show that the streams considered are surface currents (or drifts) belonging almost entirely to the Arctic ocean, and that no mention is made of the Bering strait currents. I called special attention to the fact that the *Jeannette* drifted very slowly at first, and quite rapidly later on, and used this fact as an argument in favour of land to the northward of Bennett island. It never occurred to me that the Bering strait current had any sensible influence upon this drift.

R. A. HARRIS.

The Indian Ocean Expedition.

In the current number of the *Journal* there is a notice of observations made by the Indian Ocean Expedition, and amongst other things mentioned is that "Near Providence . . . a dredging at 744 fathoms brought up 5 cwt. of stones. . . . Some masses looked like solidified ash or clay, while others appeared like volcanic bombs."

You may think it worth recording in this connection that on December 3, 4, and 5, 1883, the s.s. *Chimborazo* of the Orient line, homeward bound from Australia *viâ* the canal, passed through wide fields of floating pumice-stone at about this point. To be nearly correct, the vessel's route was along the customary course steering for Socotra. The pumice-stone, commencing at lat. 13° S., continued to be met with for 500 miles, often for hours without intermission.

I happen to have preserved an outline route-map as supplied to the ship's passengers, and recorded these notes at the time. The view we formed was that the Krakatoa catastrophe at the Sunda strait, some 1800 miles to eastward, must have been the source of the drift. The eruption had occurred in the last week of the preceding August, a little over three months before.

Charts of the Indian ocean on sufficient scale show, I think, a Sargasso sea at about the point where the pumice was encountered. What the ultimate destination of this refractory flotsam coming to a rest in this mid-ocean pool would be, seems to afford matter for a rather interesting speculation.

FREDERICK KINNARD.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905-1906.

Sixth Meeting, January 29, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS:—*Frederick Gerald Apthorpe, M.A.; Frank Baden-Powell; Walter John Barton, B.A.; Leonard Frank Beatson; Lieut.-Colonel Vere Bonamy Fane, 21st (P.A.V.O.) Cavalry, F.F.; Ernest Edward Lupton; Captain E. V. Manger (Durham Light Infantry); Alfred William Oke, B.A., LL.M., F.G.S.; Colonel Herbert C. Surtees, D.S.O.; Bertram Tanner Tanner; Major Arthur Sale Warwick (3rd P.W.O. West Yorks).*

The paper read was :—

"The Geographical Functions of Certain Water-plants in Chile" By Prof. G. F. Scott Elliot.

RESEARCH DEPARTMENT.

January 31, 1906.

"Suggestions as to an Inquiry into the Resources of the British Empire." By Prof. G. F. Scott Elliot.

February 9, 1906.

"The Ruins of Rhodesia and the probable date of Outside Intrusion in Africa." By D. Randall MacIver.

Seventh Meeting, February 12, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS:—*William Patrick Anderson; H. R. C. Dobbs, C.I.E.; Captain A. H. W. Grubb, D.S.O.; Alfred Stanley Haile; A. N. Homer; Chas. F. Croyndon Luxmore; Rev. Robert Kennedy Mackay; George W. C. Pim; Rev. Robert Austin Thomson; George Ryan Twomey.*

The paper read was :—

"The Wreck of the Spanish Armada on the Coast of Ireland." By the Rev. W. Spotswood Green, Chief Inspector of Irish Fisheries.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Is. = Isvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is $10 \times 6\frac{1}{2}$.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Germany—Coasts. **Fülscher.**
Ueber Schutzbauten zur Erhaltung der Ost- und Nordfriesischen Inseln. Von Fülscher. Berlin: W. Ernst & Sohn, 1905. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 186. *Maps. Price* 5*s.*

Contains much valuable information on coast erosion

Germany—Elbe. *Ann. Hydrographie* **33** (1905): 435-454. **Hambruch.**
Die Eisverhältnisse auf der Unterelbe. Von P. Hambruch. *With Map and Diagrams.*

Germany—Hanover. 11 *Jahresb. G. Ges. Hanover*, 1898 1905: 84-89. ———
Die Erdöl-Industrie von Wietze-Steinförde. *With Illustrations.*

Germany—Magnetism. **Neumayer.**
Eine erdmagnetische Vermessung der bayerischen Rheinpfalz 1855-56. Von Dr. G. von Neumayer (M. d Pollichia, No. 21, LXII Jahrg. 1905.) Bad Dürkheim, 1905. Size $11\frac{1}{2} \times 9$, pp. iv, 80, and lxii. *Maps. Presented by the Author*

Germany—Paper Industry. **Ward.**
German Paper Industry and Export Trade. Foreign Office, Miscellaneous, No. 642, 1905. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 14. *Price* 1*d.*

Germany—Rainfall. *Petermanns M.* **51** (1905): 193-197. **Polis.**
Die wolkenbruchartigen Regenfälle am 17 Juni 1904 im Maas-, Rhein- und Wesergebiet. Von Dr. P. Polis. *With Maps*

Hungary. *Math. u. Naturw. Berichte Ungarn* **20** (1902): 328-331. **Bernátsky.**
Uber die Pflanzenformationen des Lokvagebirges bei Baziás und Fehértemplom. Von Dr. J. Bernátsky.

Italy—Arno. *B.S.G. Italiana* **6** (1905): 739-761, 893-921. **Baratta.**
Leonardo da Vinci negli studi per la navigazione dell' Arno. Ricerche del M Baratta. *With Maps and Facsimiles.*

Italy—Sicily. *Atti R.A. Lincei, Rendiconti* **14** (2) (1905): 309-315. **Venturi.**
Nuove determinazioni di gravità relativa in Sicilia. Nota del A. Venturi.

Italy—Vesuvius. *Nature* **72** (1905): 455-456. **Günther.**
Recent Changes in Vesuvius By R. T. Günther. *With Illustrations*

Mediterranean—Cyprus. **Dunstan.**
Cyprus. Report by Prof. Wyndham Dunstan, F.R.S., on the Agricultural Resources of Cyprus, with special reference to Cotton Cultivation, and Correspondence relating thereto. London: Wyman & Sons, 1905 Size $13 \times 8\frac{1}{2}$, pp iv. and 30. *Map. Price* 5*d.*

Mediterranean—Cyprus. **Bellamy and Jukes Browne.**
The Geology of Cyprus. By C V. Bellamy and A. J. Jukes-Browne. Plymouth: W. Bendon & Son, 1905. Size $10 \times 6\frac{1}{2}$, pp. 72 *Maps and Sections. Price* 3*s.* 6*d*

Montenegro. *Petermanns M.* **51** (1905): 180–186, 197–202. **Baldacci.**
Die Arbeiten der beiden italienischen Studienmissionen 1902 und 1903 in Montenegro. Von Prof. Dr. A. Baldacci.

Montenegro. *Petermanns M.* **51** (1905): 203–206. **Hassert.**
Topographische Aufnahmen in Montenegro. Von Prof. Dr. K. Hassert. *With Map.*

Pyrenees. **Stuart-Menteath.**
Pyrenean Geology. By P. W. Stuart-Menteath. Part i. The Alpine Paradoxes (pp 16); Part ii. Scenery in Science (pp. 12); Part iii. The Pyrenean Paradoxes (pp. 20); Part iv. The Structure of the Pyrenees (pp. 28); Part v. Engineering Geology in the Pyrenees (pp. 28). London: Dulau & Co., 1903–1905. Size $8\frac{1}{2} \times 5\frac{1}{2}$.

Rumania. **Sturdza.**
Alexandro A. C. Sturdza. La Terre et la Race Roumaines depuis leurs origines jusqu'à nos jours. Paris: L. Laveur, 1904. Size $10 \times 6\frac{1}{2}$, pp. xvi. and 724. *Maps and Illustrations. Price* 20 *fr.*

A systematic account of Rumania under all aspects.

Russia. **Meakin.**
Russia: Travels and Studies By Annette M. B. Meakin. London · Hurst & Blackett, 1906. Size $9\frac{1}{2} \times 6$, pp. xx and 450. *Maps and Illustrations. Price* 16*s. net. Presented by the Publishers.* [To be reviewed.]

Russia—Finland—Languages. *Ymer* **25** (1905): 132–149. **Wiklund.**
Språken i Finland 1880–1900. Af K. B. Wiklund. *With Maps.*

S.E. Europe. **Cora.**
Guido Cora. Fra gli Slavi Meridionali. Un' escursione in Croazia e in Serbia (1902). Roma, 1904. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 90. *Illustrations. Presented by the Author.*

Spain—Forestry. *Ann. G.* **14** (1905): 318–331. **Cavaillès.**
La question forestière en Espagne. Par H. Cavaillès.

Spain—Galicia. *B R.S.G. Madrid* **47** (1905). 372–450. **Garcia de la Riega.**
Oestrymnis-Ophiusa (Geografia antigua de Galicia). Por C. Garcia de la Riega. *With Maps.*

Spain—La Mancha. *B.R.S.G. Madrid* **47** (1905): 307–333. **Blázquez.**
La Mancha en tiempo de Cervantes. Por A. Blázquez. *With Map and Illustrations.*

Sweden. **Andersson.**
Das nacheiszeitliche Klima von Schweden und seine Beziehungen zur Florenentwickelung. Von Dr. G. Andersson. (Separatabdruck aus Bericht VIII. der zürcherischen botanischen Gesellschaft 1901–1903.) Zürich-Oberstrass, 1903. Size $9 \times 6\frac{1}{2}$, pp. 18. *Maps.*

Another paper by Dr. G. Andersson on the same subject was referred to in the *Journal* for January, 1904 (p. 94).

Switzerland. **Heim.**
Beiträge Geol. Karte Schweiz (N.F.) **16** Lief. (1905): pp. x. and 654.
Das Säntisgebirge, untersucht und dargestellt von Dr A. Heim. *Text and Atlas.*

Turkey—Macedonia. *Globus* **88** (1905): 293–295. **Groos.**
Die Murichowo, ein Gebiet für deutsche Forschung und Unternehmung Von Dr. W. Groos. *With Illustration.*

United Kingdom—Coal. *Quarterly Rev.* **203** (1905): 136–165. ———
The National Coal-supply.

Based chiefly on the recent reports of the Royal Commission

ASIA.

Chinese Empire—Mongolia. *Missions en Chine* **17** (1905): 272–275. **Botty.**
Mongolie Sud-Ouest (Ortos). Lettre du P. Botty. Un voyage en barque Chinoise sur le Fleuve Jaune.

Chinese Empire—Tibet. *Quarterly Rev.* **203** (1905): 192–220. **Eliot.**
The Buddhism of Tibet. By Sir C. N. Eliot, K.C.M.G.

Chinese Empire—Tibet. *Indian Antiquary* **34** (1905): 203–210. **Francke.**
Archæological Notes on Balu-mkhar in Western Tibet. By the Rev. A. H. Francke. *With Plan and Illustrations.*

Chinese Empire—Tibet. *J. Asiatic S. Bengal* **73**, Pt. 1 (1904): 362–367. **Francke.**
A language map of West Tibet with notes. By A. H. Francke. *With Map.*

Dutch East Indies. **Weber.**
Ein Jahr an Bord I.M.S. *Siboga.* Von Frau A. Weber—*van Bosse.* Beschreibung der Holländischen Tiefsee-Expedition im Niederländisch-Indischen archipel. 1899–1900. Nach der 2. Aufl. aus dem Holländischen übertragen von Frau E. Ruge—*Baenziger.* Leipzig: W. Engelmann, 1905. Size $8\frac{1}{2} \times 6\frac{1}{2}$, pp. xiv. and 370. *Map and Illustrations. Price 6m. Presented by the Publisher.*

An interesting account of the Dutch hydrographical expedition to the Malay archipelago. The scientific results (which are exhaustively described in the series of monographs now in course of publication) are frequently touched upon in a way suitable to the general reader.

Eastern Asia—Sakhalin. *Questions Dipl.* **20** (1905): 422–435. **Labbé.**
Sakhaline. Par P. Labbé. *With Map.*

French Indo-China *B.S.G. Marseille* **29** (1905): 143–159. **Barthelémy.**
Les chemins de fer et les transports maritimes en Indo-Chine. Conférence du Marquis de Barthélemy. *With Maps.*

French Indo-China—Tongking. *B.S.G. Marseille* **29** (1905): 204–213. **Mercier.**
Souvenirs du pays Muong (Haut-Tonkin). Par le Dr. M. Mercier.

India. **[Stock.]**
Notes on India for Missionary Students, London, Church Missionary Society, 1905. Size $8\frac{1}{2} \times 6\frac{1}{2}$, pp. 112. *Maps. Price 1s. Presented by the Church Missionary Society.*

India—Anthropology. *J. Asiatic S. Bengal* **73**, Pt. 3 (1904): 39–56. **Friend-Pereira.**
Totemism among the Khonds By J. E. Friend-Pereira.

India—Assam. *J. Asiatic S. Bengal* **73**, Pt. 3 (1904): 57–74. **Gurdon.**
Note on the Khasis, Syntengs, and allied Tribes, inhabiting the Khasi and Jaintia Hills district in Assam. By Major P. R. T. Gurdon. *With Plates.*

India—Bengal. *J.S. Arts* **54** (1905): 102–124. **Bourdillon.**
The Partition of Bengal. By Sir J Bourdillon. *With Map.*

India—Burma. *J. China Br. R. Asiatic S.* **36** (1905): 1–35. **Carey.**
Notes of a Journey overland from Szemao to Rangoon. By F. W. Carey. *With Map.*

The journey was made in 1902.

India—Madras. **Francis.**
Madras District Gazetteers. Anantapur. By W. Francis. 2 vols. vol. 1 (pp. xii. and 216 maps), vol. **2** (pp iv and 44); North Arcot, vol. **2** (pp. 54); South Arcot, vol. **2** (pp iv and 52); Bellory, 2 vols., vol. 1 (pp xiv. and 342, map), vol. **2** (pp. iv. and 40); Chingleput, vol. **2** (pp. iv and 46); Coimbatore, vol. **2** (pp. 50); Cuddapah, vol. **2** (pp. 48); Madura, vol. **2** (pp iv. and 62); Nilgiri, vol. **2** (pp. iv. and 36), Trichinopoly, vol. **2** (pp. iv. and 46). Madras, 1901–1905. Size $10 \times 6\frac{1}{2}$.

India—Nagarcain. *J. Asiatic S. Bengal* **73**, Pt. 1 (1904): 276–281. **Fanthome.**
A Forgotten City. By J. F. Fanthome.

On the city of Nagarcain, founded by Akbar, but very soon abandoned to oblivion.

India—North-west Frontier. *J. R. Artillery* **32** (1905): 417–432. **MacMunn.**
The North-West Frontier of India. By Major G. F. MacMunn. *With Map.*

India—North-West Frontier and Baluchistan. **Stein.**
Report of Archæological Survey Work in the North-West Frontier Province and Baluchistan for the period from January 2, 1904, to March 31, 1905. By M. A. Stein, PH.D. Peshawar, 1905. Size $13 \times 8\frac{1}{2}$, pp. vi. and 56. *Plans and Illustrations. Presented by the Author.*

Reviewed in the present number (p. 292).

India—Pondicherry. *Tour du Monde* **11** (1905): 529–540. **Verschuur.**
Pondichéry, chef-lieu de l'Inde française. Par G. Verschuur. *With Illustrations.*

India—Rajputana. **Watson.**
Rajputana District Gazetteers. Ajmer-Merwara. Vol. 1.—A. Text (pp. x., 138, and vi.); vol. 1.—B Statistical Tables (pp. vi. and 38). Compiled by C. C. Watson. Ajmer, 1904. Size 10 × 6½. *Map. Presented by the Secretary of State for India.*

India—United Provinces. **Nevill.**
District Gazetteers of the United Provinces of Agra and Oudh. Vol. **34**, Naini Tal (pp. 330, xxxiv., and viii.); vol. **39**, Rai Barelli (pp. 230, xliv., and viii.), vol. **41**, Hardoi (pp. 276, xlvi., and viii.); vol. **47**, Partabgarh (pp. 222, xlii., and vi.); vol. **48**, Bara Banki (pp. 288, xlii., and vi.). Compiled and edited by H. R Nevill. Allahabad, and Naini Tal, 1904–1805. Size 9 × 5½. *Maps.*

Japan. **Mitford.**
A New Geography of Japan for the Upper Forms of Schools and Colleges. By C. B. Mitford. Yokohama: *Japan Gazette*, [*not dated*]. Size 9 × 6½. *Maps and Illustrations. Presented by the Author.*

The section on physical geography, which might with advantage have been placed earlier in the book, gives on the whole a good description of the surface features. The rest of the book is rather too much of the nature of a catalogue of names, and the whole suffers somewhat from undue compression.

Japan—Luchu Islands. *J. China Br. R. Asiatic S.* **36** (1905): 103-119. **Leavenworth.**
The History of the Loochoo Islands. By C. S Leavenworth.

Japan—Paper-making. **White.**
Japanese Paper-making. Foreign Office, Miscellaneous, No. 635, 1905. Size 9½ × 6½, pp. 16. *Price 1d.*

Malay Peninsula. **Martin.**
Die Inlandstämme der Malayischen Halbinsel. Wissenchaftliche Ergebnisse einer Reise durch die Vereinigten Malayischen Staaten. Von Dr. Rudolf Martin. Jena: G. Fischer, 1905. Size 11½ × 8, pp. xiv. and 1052. *Map and Illustrations. Price 60s.* [To be reviewed.]

Pamirs. **Olufsen.**
Gennem Pamir. Rejser i verdens mærgtigste Bjærglande. Af O. Olufsen. København: H. Hagerup, 1905. Size 9 × 6, pp. 236. *Map and Illustrations. Presented by the Publisher.*

Narrative of the Second Danish Pamir Expedition.

Persia. *M.V.E. Leipzig*, 1904 (1905): xxxiii.-xxxviii. **Mann.**
Reisen im westlichen Persien. Von Prof. Dr. O. Mann.

Philippine Islands. **Le Roy.**
Philippine Life in Town and Country By J. A. Le Roy. New York and London: G. P. Putnam's Sons, 1905. Size 7½ × 5, pp. x. and 312. *Map and Illustrations. Price 5s. net. Presented by the Publishers.*

An interesting, and apparently trustworthy, account of native life in the Philippines. There are chapters on the racial elements, the typical Philippine community, religion in the islands, and other subjects.

Russia—Caucasus. **Déchy.**
Kaukasus. Reisen und Forschungen im Kaukasischen Hochgebirge. Von M. von Déchy. Vols. 1 and 2. Berlin: Dietrich Reimer (Ernest Vohsen), 1905-6. Size 12 × 9, pp. (vol. 1) xviii. and 348; (vol. 2) xx. and 396. *Maps and Illustrations. Price 40m. Presented by the Publisher* [To be reviewed.]

Russia—Caucasus. **Levier.**
Émile Levier. A travers le Caucase. Notes et Impressions d'un Botaniste. 2me édn. Paris: Librairie Fishbacher, [*not dated*]. Size 10 × 7, pp. 346. *Map and Illustrations. Presented by the Publisher.*

A pleasantly written account of journeys undertaken primarily for botanical study.

Western Asia. **Zugmayer.**
Eine Reise durch Vorderasien im Jahre 1904. Von Dr. E. Zugmayer. Berlin: Dietrich Reimer (Ernst Vohsen), 1905. Size 10 × 7, pp. xii. and 412. *Maps and Illustrations. Price 12m. Presented by the Publisher.*

Account of journeys undertaken for purposes of study with a special view to

zoology. The book is, however, useful as giving a picture of the present position of affairs in some of the less visited districts of Persia and Turkey.

AFRICA.

Africa. **Bozas.**

Mission Scientifique Du Bourg de Bozas. De la Mer Rouge à l'Atlantique à travers l'Afrique Tropicale (Octobre 1900—Mai 1903). Carnets de Route. Préface de M. R. de Saint-Arroman. Paris: F. R. de Rudeval, 1906. Size 11½ × 7½, pp. viii. and 442. *Maps and Illustrations. Price 30 fr. Presented by the Publisher.* [To be reviewed.]

Congo State. *Mouvement G.* **22** (1905): 535–539. **Hendrickx.**

Une excursion dans la région des Banfunuka. Par le Père F. X. Hendrickx. *With Map.*

The district lies to the west of the lower Kwango.

Egypt. **Felix.**

Studien über tertiäre und quartäre Korallen und Riffkalke aus Ägypten und der Sinaihalbinsel. Von Johannes Felix. (Sonder-Abdruck aus der Zeitschrift der Deutschen geologischen Gesellschaft, Bd. 56, 1904.) Size 5½ × 5½, pp. (39). *Illustrations.*

Egypt. **Partsch.**

Ägyptens Bedeutung für die Erdkunde. Antrittsvorlesung bei der Einführung in das geographische Lehramt an der Universität Leipzig am 13 Mai 1905, gehalten von Prof. Dr. J. Partsch. Leipzig: Veit & Co., 1905. Size 8 × 5½, pp. 40. *Price 1s.*

Egypt—Nubia. **Kumm.**

Versuch einer wissenschaftlichen Darstellung der wirtschaftsgeographischen Verhältnisse Nubiens von Assuan bis Dongola. Von H. K. W. Kumm. Gotha, 1903. Size 9 × 5½, pp. 66. *Map and Diagram. Presented by the Author.*

A careful study of the economic conditions of Nubia.

Egyptian Sudan. *Climate* **5** (1905): 274–286. ——

The Climate of the Upper Nile. A summary of the available evidence concerning the health conditions of the Bahr-el-Gebel. *With Maps and Illustrations.*

French Congo. *Mouvement G.* **22** (1905): 480–484. **Brazza.**

La mission De Brazza au Congo français.

French Sudan. *B.S. d'Etudes Col.* **12** (1905): 449–523. **Buret.**

Le Territoire français Niger-Tchad. Par — Buret. *With Maps and Illustrations.*

French Sudan. **Decorse.**

Renseignements Col., *Comité Afrique Française* (1905): 189–197, 221–227, 268–275.

Rapport économique et zoologique sur la région du Tchad. Par Dr. Decorse.

German East Africa. *Globus* **88** (1905): 197–201, 222–226. **Booth.**

Das Nachkommen der Sulukaffern (Wangoni) in Deutsch-Ostafrika. Von J. Booth.

German East Africa. *Deutsch. Kolonialblatt* **16** (1905): 598–602, 636–637. **Chrapkowski.**

Aus dem Bericht des Regierungsrats Chrapkowski über seine Expedition vom Viktoria-Njansa (Bukoba) zum Tanganjika (Usumbura).

German South-West Africa. *M.V.E. Leipzig*, 1904 (1905): xxx.–xxxii. **Passarge.**

Deutschsüdwestafrika und der Aufstand der Herero. Von S. Passarge.

German South-West-Africa and Algeria. ——

Deutsch. Kolonialblatt **16** (1905): 606–609.

Vergleiche zwischen den Vegetationsverhaltnissen in Deutsch-Südwestafrika und Algier.

Kamerun. *M.V.E. Leipzig*, 1904 (1905). xxvii.–xxx. **Ramsay.**

Meine letzten Reisen im Schutzgebiete Kamerun 1900–1904. Von Hauptmann H. Ramsay.

Lake Chad. *La G.*, *B.S.G. Paris* **12** (1905): 305–320. **Audoin.**

Notice hydrographique sur le lac Tchad. Par — Audoin.

Will be specially noticed.

Morocco. **René-Leclerc.**
Renseignements Col., Comité Afrique Française (1905): 229 253, 295-321, 337-350.
Le commerce et l'industrie à Fez. Rapport au Comité du Maroc. Par C. René-Leclerc. *With Plan.*

Natal. **Evans.**
The Problem of Production in Natal. By M. S Evans. Durban: P. Davis & Sons, 1905. Size 7½ × 5, pp. 52. *Presented by the Author.*

North Africa—Historical. ——
Epistola Potentissimi ac Inuictissimi Emanuelis Regis Portugallie et Algarbior:, etc. De Victoriis nup: in Affrica habitis. Ad S. in xp̃o patrem et dñm nostrum dñm Leonē X. Pont. Max. [Facsimile of 1513 edition.] Lisboa, 1905. Size 8½ × 6, pp. 8. *Presented by Sr. E. do Canto.*

Portuguese Guinea *B.S.G. Marseille* **29** (1905): 214-231. **Giraud.**
La Guinée portugaise. Par J. E. Giraud.

Rhodesia. *J. Anthrop. I.* **35** (1905): 92-102. **Hall.**
Stone Fort and Pits on the Inyanga Estate, Rhodesia. By R. N. Hall. *With Plans and Illustrations.*

Rhodesia. *Deutsch Rundschau G.* **27** (1905). 446-451. **Benoke.**
Avembaland und seine Bewohner. Von A. Bencke. *With Map.*

Rhodesia—Language. **Madan.**
Senga Handbook. A short introduction to the Senga Dialect as spoken on the Lower Luangwa, North-Eastern Rhodesia. By A C. Madan. Oxford. Clarendon Press, 1905. Size 7 × 5, pp. 100. *Price 2s. 6d. net. Presented by the Publishers.*

NORTH AMERICA.

United States—California. *Nautical Mag.* **74** (1905): 978-987. **Spadoni.**
San Francisco as a Harbour and Shipping Centre. By A. Spadoni. *With Illustration.*

United States—Cities. *B. American G.S.* **37** (1905) 577-588. **Tower.**
The Geography of American Cities. By W. S. Tower.

United States—Cities. ——
Dep. Commerce and Labor, Bureau of the Census, B. **20** (1905). pp. 482.
Statistics of Cities having a population of over 25,000, 1902 and 1903.

CENTRAL AND SOUTH AMERICA.

Brazil. **Grossi.**
Prof. Dott Vincenzo Grossi. Storia della colonizzazione Europea al Brasile e della emigrazione Italiana nello Stato di S. Paulo. Roma: [E. Loescher & Co.], 1905. Size 7½ × 5, pp. 592. *Price 8s. Presented by the Publishers.*

Chile—Historical. **Arana.**
Historia Jeneral de Chile. Por Diego Barros Arana. Tomo xvi. (i ultimo). Santiago, 1902 Size 10 × 7, pp. 394. *Map.*

Costa Rica. *B.R.S.G Madrid, Rev. G. Col.* **3** (1905): 157-169. ——
La República de Costa Rica: población, agricultura, comercio, vias de comunicación, hacienda y situación general.

Panama Canal. *National G. Mag.* **16** (1905): 445-467. **Chester.**
The Panama Canal. By Rear-Admiral C. M. Chester. *With Map and Illustrations.*

Peru and Bolivia. *La G., B.S G. Paris* **12** (1905) 289-296. **Nordenskiöld.**
Exploration scientifique au Pérou et en Bolivie (1904-1905). Par E. Nordenskiöld. *With Illustrations.*

Peru and Bolivia. *Ymer* **25** (1905): 265 312. **Nordenskiöld.**
Beiträge zur Kenntnis einiger Indianerstämme des Rio Madre de Dios Gebietes. Von E. Nordenskiöld. *With Map and Illustrations.*

South America. **Martin.**
Through Five Republics (of South America). A Critical Description of Argentina, Brazil, Chile, Uruguay, and Venezuela in 1905. By Percy F. Martin. London: W. Heinemann, 1905. Size 9½ × 6, pp. xxiv. and 488. *Maps and Illustrations. Price 21s. net.*

South America—Ethnology. **Ehrenreich.**
Die Mythen und Legenden der Südamerikanischen Urvölker und ihre Beziehungen zu denen Nordamerikas und der alten Welt. Von Dr. P. Ehrenreich. (Supplement zu *Zeitschrift für Ethnologie*, 1905.) Berlin: A. Asher & Co., 1905. Size $10\frac{1}{2} \times 7$, pp. 106. *Price* 3*s*.

AUSTRALASIA.

Pacific Islands—Botany. **Guppy.**
Observations of a Naturalist in the Pacific between 1896 and 1899. By H. B. Guppy. Vol. 2, Plant-dispersal. London: Macmillan & Co., 1906. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xxvi. and 628. *Maps and Illustrations. Price* 21*s. net. Presented by the Publishers.* [To be reviewed.]

POLAR REGIONS.

Arctic—Eskimo. *Ymer* **25** (1905): 173–192. **Simmons.**
Eskimåernas forna och nutida utbredning samt deras vandringsvägar. Af H. G. Simmons. *With Maps and Illustrations.*

On the past and present distribution of the Eskimo and their migrations.

Arctic—Eskimo. **Steensby.**
Om Eskimokulturens Oprindelse. En etnografisk og antropogeografisk studie. Af H. P. Steensby. København: Brød. Salmonsens Boghandel (I. Salmonsen), 1905. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 220. *Presented by the Author.*

Arctic—Hudson Bay. *Quarterly J.R. Met. S.* **31** (1905): 317–326. **Hepworth.**
Climatological Observations at an Arctic Station in Repulse Bay. By Commander M. W. C. Hepworth. *With Diagrams.*

The observations were taken by Captain J. A. Murray in the winter and spring of 1903–4.

Arctic—North-East Passage. *Ann. Hydrographie* **33** (1905): 483–497. **Herrmann.**
Die Bedeutung der Nordostdurchfahrt für die Schiffahrt. Von J. Herrmann.

Arctic—Voyage of the "Vega." *Ymer* **25** (1905): 121–131. **Hovgaard.**
Vegafärden. Minnesord på 25te årsdagen af Vegas återkomst till Stockholm. Af A. P. Hovgaard

Address in memory of the voyage of the *Vega* on the twenty-fifth anniversary of the return of the famous ship.

Greenland—Glaciers. *M K.K.G. Ges. Wien* **48** (1905). 426–433. **Engell.**
Einige Beobachtungen über die Kalbungen im Jakobshavner Eisfjorde und den benachbarten Fjorden. Von Dr. M. C. Engell.

Polar Regions. *La G., B S.G. Paris* 12 (1905): 321–327. **Rabot.**
Projet d'exploration systématique des régions polaires. Par C. Rabot

On the proposed International Association for the study of the polar regions.

MATHEMATICAL GEOGRAPHY.

Astronomy. **Kobold.**
Der Bau des Fixsternsystems mit besonderer Berücksichtigung der photometrischen Resultate. Von Dr. H. Kobold. (Die Wissenschaft, Heft 2) Braunschweig: F. Wieweg und Sohn, 1906. Size $9 \times 5\frac{1}{2}$, pp. xii. and 256. *Illustrations. Price* 5*m*. 60. *Presented by the Publishers.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Hydrology. *Minutes of P.I. Civil Engineers* **161** (1905): 345–349. **Hill.**
The velocity of water flowing down a steep slope. By E. P. Hill.

Limnology. *Petermanns M.* **51** (1905): 258–259. **Aufsess.**
Untersuchungen über die Erhöhung der Temperatur am Grunde der Seen. Von Dr. O. Frhr. v. u. z. Aufsess.

Meteorology. **Billwiller.**
Der Bergeller Nordföhn. Inaugural-Dissertation . . . von R. Billwiller. (Sonder-Abdruck aus den Ann. Schweiz. met. Centralanstalt, Jahrg. 1902.) Zürich, 1904. Size 12×10, pp. 56. *Diagrams.*

Meteorology. *B. Musée Océanograph. Monaco*, No. 44 (1905): pp. 8. **Hergesell.**
La Situation actuelle et quelques Problèmes futurs de la Météorologie maritime. Exposé présenté à S.A.S. le Prince Albert de Monaco. Par H. Hergesell.

Meteorology. *Met. Z.* **22** (1905): 398–412. **Meinardus.**
Ueber Schwankungen der nordatlantischen Zirkulation und damit zusammenhangende Erscheinungen. Von Dr. W. Meinardus.

Meteorology. *Nature* **73** (1905): 54–56. **Rotch and Bort.**
The Exploration of the Atmosphere over the Tropical Oceans. By Dr. A. L. Rotch and L. Teisserenc de Bort. *With Diagrams.*

Seismology. **Ballore.**
F. de Montessus de Ballore. Les Tremblements de Terre. Géographie seismologique. Avec une Préface par M. A. de Lapparent. Paris: A. Colin, 1906. Size 19 × 6½, pp. vi. and 476. *Maps. Price* 12 *fr. Presented by the Publisher.* [To be reviewed.]

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Historical—Early Voyages. **Raleigh.**
The English Voyages of the Sixteenth Century. By Walter Raleigh. Glasgow: J. MacLehose & Sons, 1906. Size 8½ × 5½, pp. 206. *Frontispiece. Price* 4*s.* 6*d. net. Presented by the Publishers.*

A most interesting account of the beginnings of British maritime enterprise, looked at not as mere historical facts, but in their relation to the life and growth of the nation.

Historical—Humboldt's Travels. **Hamy.**
Lettres américaines d'Alexandre de Humboldt (1798–1807). Précédées d'une Notice de J. C. Delamétherie et suivies d'un Choix de documents en partie inédits. Publiées avec une Introduction et des Notes par le Dr. E. T. Hamy. Paris: E. Guilmoto, [1904]. Size 9 × 5½, pp. xl. and 310. *Map. Price* 7 *fr.* 50.

A collection of letters, never before brought together, which originally appeared in French, German, and Spanish journals during the course of the American journeys.

Historical—Triremes. **Cook.**
Triremes. By A. B. Cook. (From the *Mid-Tyne Link*, vol. **2**, No. 6, 1905.) Newcastle-upon-Tyne. Size 9½ × 6½, pp. 69–81. *Illustrations. Presented by the Editor.*

See note in the December number (p. 678).

BIOGRAPHY.

Varenius. **Günther.**
Varenius Von Prof. Dr S. Günther (Klassiker der Naturwissenschaften herausgegeben von L. Brieger-Wasservogel IV. Bd.) Leipzig: T. Thomas, [1905]. Size 9 × 6, pp. 218. *Price* 3 *m.* 60 *pf. Presented by the Publisher.*

GENERAL.

Mediterranean Lands. **Fischer.**
Mittelmeerbilder. Gesammelte Abhandlungen zur Kunde der Mittelmeerländer. Von Dr. T. Fischer. Leipzig und Berlin: B. G. Teubner, 1906. Size 9 × 6, pp vi. and 480. *Price* 7*s.* [To be reviewed.]

Physiological Geography. **Zuntz and others.**
Höhenklima und Bergwanderungen in ihrer Wirkung auf den Menschen. Ergebnisse experimenteller Forschungen im Hochgebirge und Laboratorium. Von Dr. N. Zuntz, Dr. A. Loewy, Dr. F. Müller, Dr. W. Caspari. Berlin, etc.: Bong & Co., 1906. Size 11½ × 8½, pp. xvi. and 494. *Illustrations. Price* 18*s.*

Tables. **Martin.**
Martin's Tables, or "One Language in Commerce," containing tables and information upon Imperial, Metric, Indian, and Colonial Measures and Weights, Simple suggestions for Metric adoption, Imperial Decimal Coinage, Foreign, Indian, and Colonial Moneys, Standard Time, Decimalization of the Circle, Compass, etc. By A. J. Martin. London: T. Fisher Unwin, 1906. Size 6 × 4½, pp. 272. *Price* 2*s.* 6*d. Presented by the Publisher.*

A revised edition of these useful tables

Year-book. **Ito.**
The World Year-book for 1905. Compiled by S. Ito. [In Japanese.] Size 10½ × 7½. *Maps and Illustrations. Presented by the Compiler.*

Year Book. **Wagner.**

Geographisches Jahrbuch, xxviii. Bd 1905. Herausgegeben von H. Wagner. 1. Hälfte. Gotha: J Perthes, 1905. Size 9 × 6, pp. 290.

This part contains reports on progress in Ethnology, Geophysics, Ancient Geography, and Phytogeography.

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(*E. Stanford, London Agent.*)

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets (new editions): V.-17, Quimperlé; VI.-18, Vannes; XXI.-25, Lyon (Nord-Ouest). Paris: Ministère de l'Intérieur, Service Vicinal, 1905. *Price* 0.80 *fr. each sheet.*

Germany. **K. Preussische Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartographischen Abteilungen der Königlichen Preussische Landesaufnahme. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheet (brown hills and contours) 359, Uslar. Berlin: K. Preussische Landesaufnahme, 1905. *Price 1.50 mark each sheet.*

ASIA.

Philippine Islands. **U.S. Post Office Department.**

Post Route Map of Philippine Islands, showing Post Offices in operation on September 1, 1905. Published by order of Postmaster-General Geo. B. Cortelyon, under the direction of A. von Haake, Topographer P.O. Dept. Scale 1 : 823,680 or 1 inch to 13 stat. miles. 2 Sheets. Washington: Post Office Department, 1905. *Presented by the Fourth Assist.-Postmaster-General, Washington, U.S.A.*

A most useful map for general reference. It is clearly drawn, printed in colours, but without hill-shading, which is a decided advantage in a map of this character. Railways, postal routes, telegraph cables, and much other information will be found on the map.

Singapore. **Surveyor-General, Straits Settlement.**

Map of the Island of Singapore and its dependencies. Scale 1 : 63,360 or 1 inch to a stat. mile. 2 Sheets. Singapore: Surveyor-General's Office, 1904. *Price 11s. 6d.*

This is a revised edition of a map first published in 1898. It shows forest reserves, railways, roads, trigonometrical stations, boundaries, and other information. The map is printed in colours, but is somewhat rough in appearance.

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. Sheet 123, Angra Pequena. London: Topographical Section, General Staff, War Office, 1906. *Price 2s. each sheet. Presented by the Director of Military Operations.*

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: (Gold Coast), 60-G, 60-K, 60-L. London: Topographical Section, General Staff, War Office, 1906. *Price 1s. 6d. each sheet. Presented by the Director of Military Operations.*

Khartum. **Stanton.**

Provisional Map of Khartum City, Khartum North, and Omdurman. Scale 1 : 253,440 or 1 inch to 4 stat. miles. Compiled for use of the Khartoum Mudiria, by Lieut.-Colonel E. A. Stanton, Governor Khartum Province. 2 Sheets.

Colonel Stanton has compiled this map from various sources. A prismatic-compass sketch, by Captain Morant, serves as the basis of the Omdurman section; Khartum city, and Khartum North have been taken from a survey by Mul Awal Muhd eff Samaha, whilst the land between the White and Blue Niles is from a survey by Mustafa Bey Ramzi. The map is well drawn and carefully printed, and although it is stated to be only a provisional publication, it supplies a felt need, and will doubtless be of great service.

AMERICA.

Bolivia. **Hoek and Steinmann.**

Routenkarte der Expedition Steinmann, Hoek, v. Bistram in den Anden von Bolivien, 1903–04. Entworfen von H. Hoek und G. Steinmann. Scale 1 : 750,000, or 1 inch to 11·8 stat. miles. 2 sheets. *Petermanns Mitteilungen*, Jahrgang, 1906, Tafeln 1 u. 2. Gotha: Justus Perthes, 1906. *Presented by the Publisher.*

A brief account of the work accomplished by this expedition was given to this Society by Dr. Hoek in his paper published in the *Geographical Journal* for May, 1905. At that time the complete map had not been compiled, and that illustrating the paper was only a provisional sketch. However, since then the map has been finished and is now published in two sheets, with a paper, in *Petermanns Mitteilungen*. The geology of the country traversed is indicated on the maps, not by colouring, as is usually the case, but by notes. Although not professing to be any more than a route map, a considerable amount of information is given.

mountain, and its beautiful surroundings. The points from which the views have been taken have evidently been carefully selected, and the pictures are most artistic in effect.

Kashmir. **Ferber.**

Ninety-five photographs of the Karakoram Himalayas, taken by Herr A. C. F. Ferber. *Presented by Herr A. C. F. Ferber.*

The expedition of Messrs. Honigmann and Ferber to the Karakorum Himalaya last year, like that of Dr. and Mrs. Workman, supplements the work of Sir Martin Conway in 1892, and the photographs mentioned below, which were taken upon the expedition, form a most valuable addition to the large number taken by Sir Martin Conway and deposited with the Society. The photographs are excellent quarter-plates, and have been bound in an album by Mr. Ferber, who has also taken pains to carefully name and describe them.

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Somaliland. **Swayne.**

Seven photographs of camels and watering-places of the Haud, Somaliland, taken by Brigadier-General E. J. E. Swayne, C.B. *Presented by Brigadier-General E. J. E. Swayne, C.B.*

Typical photographs of camels and watering-places in the barren region of the Haud, which has to be traversed by caravans going to the south of British Somaliland.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

GENERAL.

World. **Schrader.**

L'Année Cartographique. Supplement annuel à toutes les publications de Géographie et de Cartographie, dressé et rédigé sous la direction de F. Schrader. Quinzième Année contient les modifications géographiques et politiques de l'année 1904. Paris: Hachette et Cie., 1905. *Price* 3 *fr.*

This fifteenth issue of Schrader's "L'Année Cartographique," gives a brief summary of the more important geographical explorations, surveys, and modifications to boundaries during the year 1904. It is similar in style and arrangement to previous issues. There are three sheets—one devoted to Asia, another to Africa, and the third to America. The Asia sheet gives maps illustrating the explorations of M. V. Obrontcheff in Northern China, Lieut. Oum in Indo-China, and Captains Rawling and Hargreaves in Western Tibet. In addition to these there are three small insets showing the progress of triangulation in Indo-China.

The Africa sheet contains a map of Lake Chad by Lieut. Boudry, a map showing the explorations of Commandant Laperrine and others in the Sahara, a sketch showing the new political division in French West Africa, from sketch-maps showing the modifications to French and British possessions in West Africa, and a small inset of the Los islands.

The third sheet, devoted to America, contains two maps, one showing the Appalachian mountains and the Canadian Great lakes from the U.S. Coast and Geodetic Surveys, and the other a sketch-map illustrating the surveys of Drs. Steinmann, Hoek, and Bistram, and of F. O'Driscoll in Argentina and Bolivia.

The back of each map contains brief descriptive notes upon the principal geographical work of the year in each of the continents dealt with.

CHARTS.

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for February, 1906. London: Meteorological Office, 1906. *Price* 6*d*. *Presented by the Meteorological Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for February, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Bombay Presidency. **Varley.**

Five photographs of Satara and Mahableshwar, Bombay Presidency, taken by F. G. Varley, Esq. *Presented by F. G. Varley, Esq.*

Mr. Varley has sent these photographs as a first instalment in response to a special request for views of India for the Society's collection. Whilst we have many photographs of the frontier and trans-frontier regions of India, very few have been presented of the peninsula itself. The titles are as follows:—

(1) Collecting branches broken off by locusts; (2) Tree broken to pieces by the weight of locusts sitting on it; (3) Locusts eating scrub jungle, Satara; (4) Locusts flighting, Mahableshwar; (5) Mahableshwar, saddle-back hill in distance.

China. **Turley.**

Fourteen photographs of Peking and Mukden. *Presented by R. T. Turley, Esq.*

The views of the Imperial tombs and summer palace are of special interest. Upon all the photographs Mr. Turley has written full descriptions, from which the following short titles have been taken:—

(1) The new Legation street, Peking; (2 and 3) Lake within the palace grounds, Peking; (4) Outside wall of palace enclosure, Peking; (5) The summer palace, near Peking; (6) The tomb of Wen Wang, the builder of Mukden city; (7) The Great Wall at Shan-hai-kuan; (8) Great East street, Mukden; (9 to 14) The Imperial Manchu tombs, Mukden.

Japan. **Ponting.**

Twenty-five reproductions of Fuji San, from photographs by H. G. Ponting, Esq. *Presented by H. G. Ponting, Esq.*

This is an album of excellent photographic reproductions of Japan's most famous

mountain, and its beautiful surroundings. The points from which the views have been taken have evidently been carefully selected, and the pictures are most artistic in effect.

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The
Geographical Journal.

No. 4. APRIL, 1906. Vol. XXVII.

THE RHODESIA RUINS: THEIR PROBABLE ORIGIN AND SIGNIFICANCE.*

By DAVID RANDALL-MACIVER, M.A., D Sc., F.R G.S.

Though the problems of the origin and date of the ruins in Rhodesia had been before the public for about a generation, from the time, in fact, that Mauch rediscovered Zimbabwe, yet up to the present year remarkably little progress had been made towards their solution. In part this was due to the difficulty of exploring a country that has only recently been opened up, in part to the concentration of attention upon a single group out of all the ruins which were available for study, and in part to the want of system with which any investigations had been conducted.

The British Association, when it arranged to visit South Africa in 1905, resolved to make an effort to end this uncertainty, and asked me to precede them by some months in order to explore and to prepare a special report upon the subject of the ruins. Owing to the great improvements effected in the means of communication, and to the exceptional facilities afforded to me, I was able to conduct my researches over a great extent of country, and to obtain observations which have led me to very definite conclusions, which may be briefly summarized in this paper.

It is proper to recall that this was not the first occasion on which the British Association had manifested its interest in this subject, for it was with the aid of a grant from that society that Mr. Theodore Bent, in 1891, made a partial exploration of the site called, *par excellence*, Zimbabwe, as a result of which he published his well-known volume 'The Ruined Cities of Mashonaland.' To Mr. Bent, as his successors must gratefully acknowledge, is due the credit of having awakened the popular interest and enthusiasm; but to him, in great measure, is

* Research Department, February 9, 1906.

also due the responsibility for the unscientific trend which that interest has taken. Before there was sufficient evidence on which to base any suggestions whatsoever as to origin or date, popular opinion settled the question to its own satisfaction, decided that the Rhodesian ruins must be of immense antiquity, and (following the mediæval chroniclers in a genuinely mediæval spirit) pronounced them to be the work either of Solomon and the Queen of Sheba, or at least of some of their Oriental contemporaries. The halo of melodramatic romance, once created, is difficult to dissipate, but I propose to make the effort.

First, to summarize the state of the question as it stood a year ago.

1. Many articles had been found by the several persons who had dug at Zimbabwe and elsewhere, but not a single object had been obtained from the ruins which an archæologist could recognize as more than a few centuries old.

2. There was no authenticated instance of a single inscription having been found in the country.

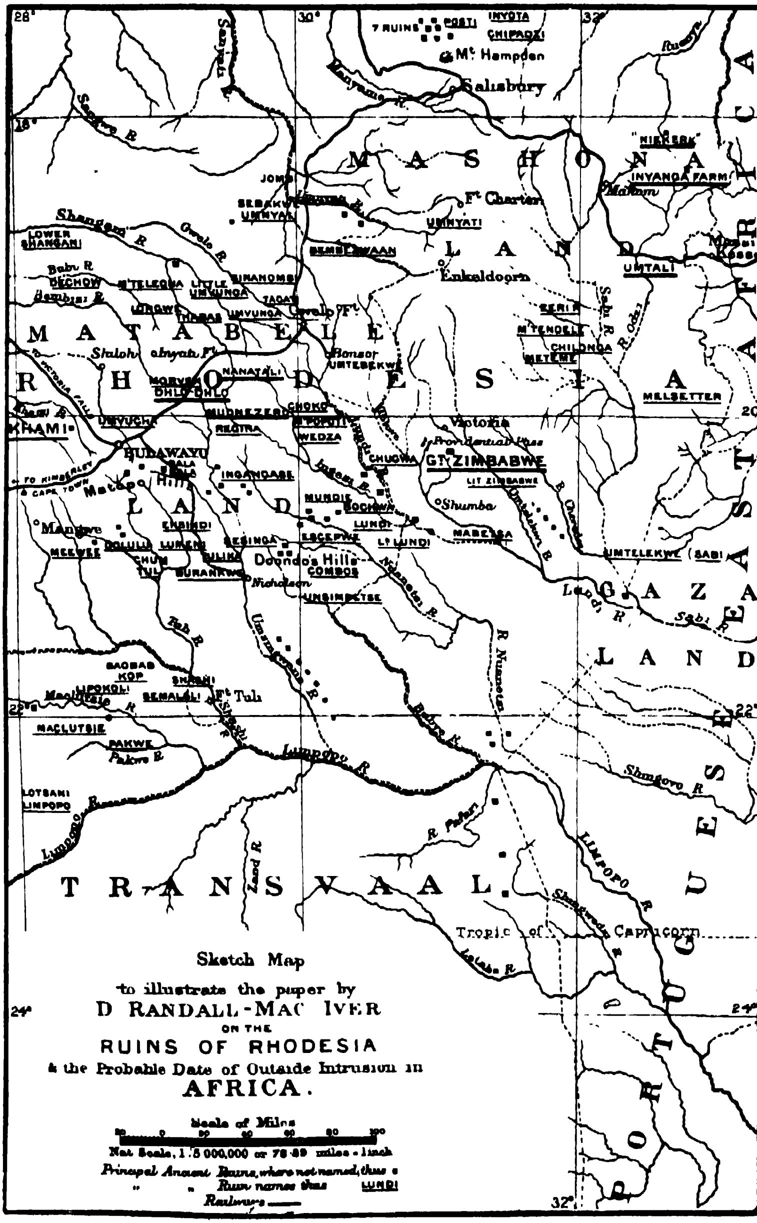
3. On the other hand, the weapons, ornaments, etc., which had been found could be recognized in almost every case as typical products of African peoples; and—

4. Some articles which were not African could no less definitely be recognized as Oriental imports of mediæval date. These were Nanking china, Celadon china, Persian fayence, and Arabic glass.

5. An expert surveyor had shown that the measurements on which Mr. Swan had based his astronomical deductions as to the date of the Great Zimbabwe were entirely erroneous. So that Mr. Swan's work shared the fate of Piazzi Smyth's, which on the face of it always looked probable.

There was, therefore, in spite of the popular opinion to the contrary, no case whatsoever, even a year ago, on which it could be argued that the ruins were of any great antiquity. At the same time, it was generally felt that the observations which had been made were by no means of a satisfactory character. It was possible that the collections which had been made were not representative, and that the foundation-levels had not been properly examined. Underneath the mass of what was undoubtedly mediæval there might exist older strata. The Kaffir things which had been found might not belong to the original inhabitants, but to subsequent settlers. And the latest of the untrained excavators, who had been permitted to carry out excavations at the Great Zimbabwe, asserted this to be the case. He had, indeed, been able to produce no specimens which could prove his assertion that the alleged different levels belonged to widely different periods of time, but it was possible, nevertheless, that the statement might prove to be true.

It was my task, therefore, to carry out such representative excavations as should determine—


Sketch Map
to illustrate the paper by
D RANDALL-MAC IVER
ON THE
RUINS OF RHODESIA
& the Probable Date of Outside Intrusion in
AFRICA.
Scale of Miles
Nat. Scale, 1:5 000,000 or 78·89 miles - 1 inch
Principal Ancient Ruins, where not named, thus
" " Ruin names thus LUNDI
Railways
MASHONA LAND
MATABELE LAND
RHODESIA
GAZA LAND
TRANSVAAL
PORTUGUESE EAST AFRICA
Salisbury
Mt Hampden
Ft Charter
Enkeldoorn
Victoria
GT ZIMBABWE
BULAWAYO
Matoppo Hills
Dondo's Hills
Ft Tuli
UMTALI
MELSETTER
Tropic of Capricorn
Lundi R
Sabi R
Limpopo R
Shangani R
Umnyati R

1. Whether more than one period of time was represented in the ruins.

2. What was the approximate date of the period or periods.

3. Whether, apart from the question of chronology, the ruins had been built by the people who left there implements and ornaments of African types, or whether these were the result of a mere casual occupation.

I consider that my excavations have given the answer to these questions, and have proved—

1. That the Rhodesian ruins belong to one period only.

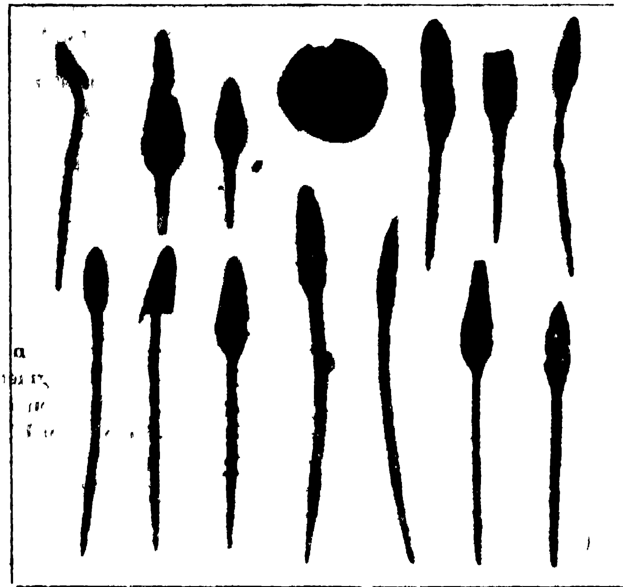
2. That the period in question is mediæval and post-mediæval.

3. That the buildings were constructed by the people whose implements, weapons, and ornaments are found there—that is to say, by a negro or negroid race closely akin to the present dwellers in the country.

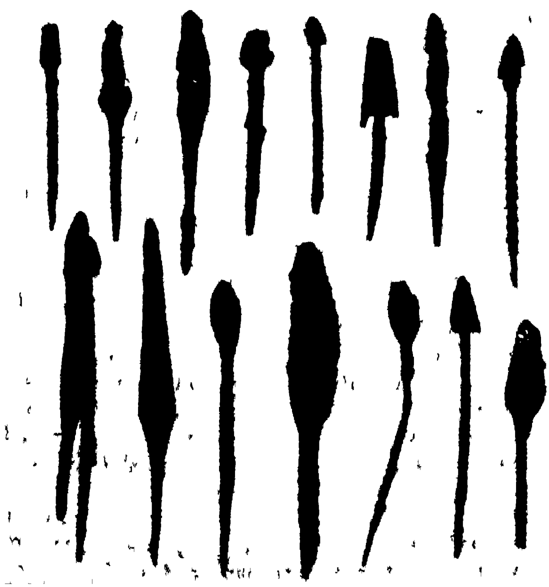
The space available compels me to condense my account on the present occasion within very narrow limits, but I will endeavour to bring the chief points before you, and there will be ample opportunity, in the discussion which is to follow this paper, to cross-question me on all matters of detail.

The sites which I explored were seven in number. Three, in the more northern part of the country, contained rude buildings of stone which are more primitive in character and actually a little more ancient in date than the better-known constructions of Matabeleland and the Victoria district. These three sites are—The Rhodes estate at Inyanga, a remote place 16 miles north of the Rhodes estate which I have named the Niekerk ruins, and Umtali. The other four are Dhlo Dhlo, Nanatali, Khami, and the Great Zimbabwe, which exhibit a more elaborated style of building, but do not differ in any essential points from the more northern sites. As, however, the most decisive evidence of date and origin was obtained from the southern ruins, I shall deal chiefly with them in this paper.

Dhlo Dhlo, in the Insiza district, is a fort—or, to be more exact, a fortified kraal—the plan of which is very similar to that of rough hill forts at Inyanga. The central portion forms a sort of acropolis, well built with slabs of very slightly dressed granite. The walls, as in all these buildings, form, not angles, but curved arcs. The principle of construction, in fact, is everywhere the ellipse, though adaptation to every irregularity of the ground produces a plan which is generally very unsymmetrical. At Dhlo Dhlo the walls of the acropolis rise on the north-west front in three tiers, ornamented with the four characteristic motives of chess-board, herring-bone, chevron, and cord pattern. (Be it remarked, in passing, that these patterns are all characteristically African, and found in every corner of the continent, north, south, east, and west.) Except on the principal front, where the ground is less



DEPOSIT OF IRON WEAPONS AND A COPPER INGOT FOUND BENEATH THE INTACT CEMENT FLOOR OF A PLATFORM IN THE HEART OF THE CITADEL AT DHLO DHLO



DEPOSIT OF IRON WEAPONS FOUND BENEATH THE INTACT CEMENT FLOOR OF A PLATFORM IN THE HEART OF THE CITADEL AT DHLO DHLO.

broken than elsewhere, there is only a single rampart of stone. The acropolis is encircled, except on the front, by an undecorated and very roughly built wall, the space between being occupied by hut-foundations. Where this girdle wall ceases there are small outworks at a short distance in front of the entrance to the acropolis.

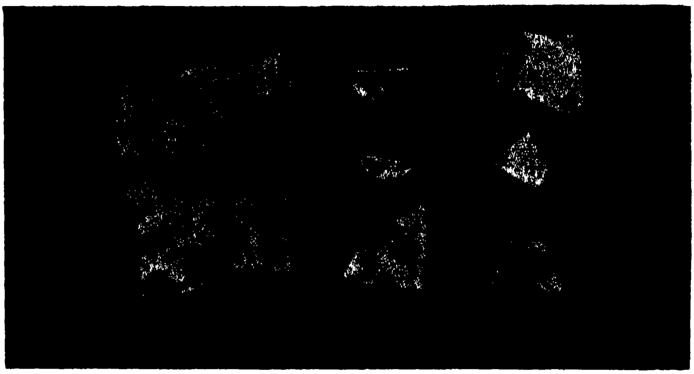
I excavated at three places. The first was by one of the outworks just mentioned, at a spot which proved to have been used as a smelting-place; the draught-pipe was in position, and there were several pieces of tin slag. Tin is not known as a product of Rhodesia, but a Portuguese chronicler mentions it as part of the cargo of a ship of Cambay in 1519 A.D. In the rubbish-heap thrown out from the hut-foundation next to this were iron tools, fragments of green glass, and fragments of Nanking china. The second place was a great kitchen midden on a steep slope on the side of the acropolis. This heap must have formed by the inhabitants flinging all their rubbish over the slope. It consisted of the contents of wood fires, with which were many objects, mostly in a fragmentary condition. Here I found many iron articles (including a pair of manacles of a type figured on a sixteenth-century Valencia tile), stone flakes probably used for engraving pottery, bronze wire and bronze sheathing, copper bangles, cores of copper produced in casting, fragments of bell-metal, beads—some of which were of glaze and porcelain—fragments of Nanking china, etc.

So far the objects found were sufficiently diagnostic, viz. Kaffir weapons and implements, Indian beads, mediæval metalwork, sixteenth or seventeenth century porcelain, etc. The kitchen midden was in the centre of the buildings, and obviously belonged to them. Still, it was advisable to go further. So I looked for a hut within the very heart of the acropolis, close to the entrance, and, as the floors of the huts (for a reason presently to be explained) stood on different levels, selected one on the lowest level. Digging a section through it, I found below the unbroken cement floor, in the rubble and cement which formed the foundation of the hut, the following objects: a sheaf of typical Kaffir assegais; a piece of copper from the crucible, copper bangles; fragments of tin; a spindle-whorl; glaze beads; two pieces of flowered blue-and-white Nanking china. Even if the tin and the glaze beads did not sufficiently indicate the period, the Nanking china, which is certainly not earlier than the sixteenth century A.D., would do so. These objects, being found in the foundations of a hut which, even if there had been several distinct periods at Dhlo Dhlo (as certainly there are not), must from its position have belonged to the earliest period, establish the date of Dhlo Dhlo as sixteenth to seventeenth century A.D.

It is important that the nature and construction of the huts should be clearly understood. In a word, then, these huts, which occur alike in the Inyanga district and in Matabeleland and at Zimbabwe, are the really essential part of the settlement in each case. The stone walls,

which have been so much admired, are merely more or less elaborate ring fences enclosing them. At Dhlo Dhlo, Nanatali, Khami, and Zimbabwe the huts are built of a strong concrete or cement, made probably from powdered granite, very similar to what Lobengula used in his kraal. They are circular in form, and often partitioned into several sections. Thus there is commonly an inner circle, 5 metres in diameter in typical cases, from which partition walls, about 5 metres in length, radiate to meet the circumference of the outer ring. The walls in many cases are still standing to a height of several feet. The floor, like the walls, is of cement, a layer of it being placed upon rubble of stones, a foundation which is strengthened at intervals by wooden posts.

Now, these huts are not confined to one site, but are found in every



NANKING CHINA FOUND AT DHLO DHLO.

The large piece with (blue) flower-pattern was beneath the intact cement floor of a platform in the heart of the citadel.

place which I explored, with the exception of Umtali, where an equally African type (that of stone rings to support wooden posts, which occurs also on the Inyanga sites) replaces them. They are not sporadic, for they are found in every part of an area so immense as that of the Niekerk ruins, where there are over 50 square miles of uninterrupted settlement. They are not subsequent to the stone walls, for they occur not only outside and inside them, but also built into one indivisible mass with them, so that at the Niekerk ruins and Nanatali they present almost the appearance of bastions. At Dhlo Dhlo the whole interior of the Acropolis, and at Zimbabwe the whole interior of all the buildings, have been filled with these constructions of rubble and cement, which fit as closely to the sides of the stone walls as water frozen into a glass. At Zimbabwe the cement is outside as well as inside the stone walls; it forms a bed over the original bottom of rock or sand, a bed in which the stone walls are set like molars in a jaw.

Whatever, therefore, is found *in* or *underneath* the floors of such huts must necessarily be contemporary with the stone building.

At Dhlo Dhlo, as I have remarked in passing, the huts in the Acropolis stood on different levels. This was sometimes due to the prejudice of the old builders in favour of having horizontal floors for their dwellings. The foundation was in any case built up with varying depths of rubble from the uneven ground, but where the bed rock dipped a great deal, it was easier to make separate levels for the floors of adjoining huts than to raise them all to a uniform height. Sometimes, however, there was a real ceremonial reason for the distinction, as appears from a study of Nanatali.

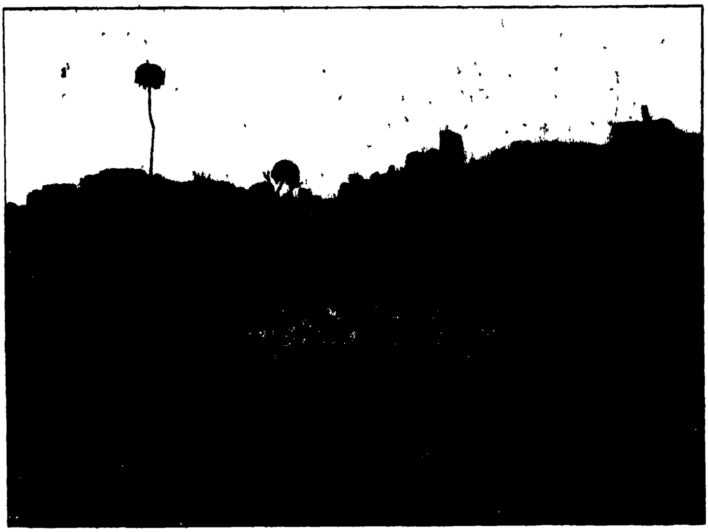
Nanatali, with its monoliths on the wall and its symmetrical plan, is the most attractive of all the buildings which I have seen. It is also one of the most instructive. A study of the ground plan reveals the significant fact that here we have a direct translation into stone of exactly that principle of construction which I have been describing in the cement huts, for the main hut, which occupies the northern half of the enclosure, is connected with the stone girdle wall round it by *stone* partitions radiating out from it like the spokes of a wheel; and when we realize that precisely the same principle of construction is found within the elliptical temple at Zimbabwe, it will be evident that it is unnecessary to fly to the Orient to find analogies for the plan of the latter building.

Again, Nanatali has a no less useful lesson to teach with regard to the levels. In the centre of the northern half of the enclosure is the principal hut. This stands on an artificial platform of cement and stones strengthened by posts, which rises $2\frac{1}{2}$ metres above the surrounding ground; but the other three huts, which the plan shows to be no less integral parts of the whole building, are on a different level, fully 2 metres below the first. From its size, its position, and the fact that it possesses a special entrance of its own, and that all access to it from other sides is barred, it is evident that the main hut was that of the chief. It was, therefore, in deliberate recognition of his dignity that it was erected on a higher plane than the others.

Nanatali was evidently inhabited only for a very short time. I found in one of the huts a large iron nail with screw head, two iron spears, an iron band, and twisted copper; and in a *débris* heap outside one of the entrances, a copper implement and two dakka pipes of soapstone.

Of Khami I need only say, in this place, that the results obtained from it were exactly the same as were obtained from the other ruins. There was not a trace of superposition of periods, and the objects found were just like those found on the other southern sites, viz. Kaffir spears, assegais and axes of iron, soapstone pipes, copper and bronze metalwork, tin, blue-and-white porcelain, and a mediæval iron key.

Next I may treat of Zimbabwe. The "elliptical temple" is a most interesting building, the finest example of its kind, but that kind is only the same that has been noted on other sites in Rhodesia. The "temple" has, in fact, scarcely a feature which cannot be explained on the view that it is a royal kraal, of which the plan is derived from a combination of the Inyanga or Dhlo Dhlo fort with such a building as Nanatali. It is simply more massive, and has no other point of superiority over several of the other ruins. And, without wishing to disparage it, I think it necessary to protest against the highly exaggerated idea of its perfection which is so generally entertained by



NANATALI: FRONT, SHOWING ENTRANCE, STONE RING WALL, AND CEMENT WALLS OF THE CHIEF'S HUT ON A PLATFORM INSIDE.

those who have not seen Zimbabwe. It evinces no knowledge of architecture; only a certain skill in piling up stones. The famous "temple" is inferior to Nanatali in symmetry and beauty.

The first question to be decided was whether there were any traces on the surface of secondary building. As to this, I can say unhesitatingly that the assertion that certain walls have been rebuilt is erroneous, and is due to an imperfect knowledge of the characteristics of the Rhodesian ruins in general, and of the shoddy methods of their builders.

Next, it was necessary to test the assertion that there was a superposition of periods. The last excavator had nearly rendered this impossible by ruthlessly sweeping out of the interior almost everything

that stood above ground down to floor-level. He had, however, left a small corner in enclosure 15, only about 1 metre in diameter, but standing almost to its original height. By a curious piece of good fortune, this was the part of which he had published a section, distinguishing six or seven strata above the level of the floor. It was evident at the first glance that these strata were an illusion; the whole height of the mass (1·9 metre from the floor upwards) was homogeneous cement, and it had been the platform of such a hut as has been described above. The excavator in question states that he destroyed a "modern Makalanga" hut which stood on this patch, and the destruction is unfortunately complete. But in the cement foundation of that hut I found the usual supporting wooden baulks, one of which was over a metre long, and so would have passed through several of the supposed chronological strata. As a matter of fact, this excavator, not understanding how such platforms were made, had mistaken the layers formed by the separate blocks of cement for chronological periods. That there was no difference in character between the contents of the mass at different depths I found by digging. The rubbish thrown in with the cement contained exactly similar articles at all depths; and at 3·3 metres below the level of his "modern" Makalanga hut I found spindle-whorls, coils of copper for bracelets, and pottery, all of just the same kind as occurred on the level of that hut.

This is the lowest spot in the temple; the articles I refer to were found below the level of the foundation walls, and consequently the walls of the "temple" were erected on a higher level than one which contains typical Kaffir products.

Like the other ruins, therefore, the "elliptical temple" was built by Kaffirs, and its date is decided by fragments of china, Nanking ware, and mediæval Arabic glass. The interior was wholly, or almost wholly, occupied at one time by circular platforms of cement of the kind which have been described, but only traces of these now remain.

From the valley ruins I obtained analogous results; there was no superposition of periods anywhere, and off the ground-rock I recovered mediæval Persian fayence, glaze and glass beads, as well as many Kaffir articles.

There can, therefore, be no reasonable doubt as to the date of the elliptical temple and other buildings at Zimbabwe. They are contemporary, to within a century or so, with Dhlo Dhlo, Nanatali, and Khami, not earlier than 1400 or 1500 A.D., and possibly even later.

Simply as an inhabited site, Zimbabwe may have been occupied a little longer, for below the level of the walls I found a thin stratum of ashes containing "Makalanga" objects, 0·8 metre thick, which *might* have been formed by an earlier settlement. This settlement, however,

of which there was no other trace, would not extend the date of its occupation more than a few generations. If such a hypothetical settlement existed, it would have been contemporary with the roughly built ruins of Inyanga and the Niekerk ruins. For that these hill forts, intrenchments, and pit-dwellings date from slightly before the Portuguese period I infer from the absence of imported mediæval articles, as well as from Dos Santos' statement that certain ruins a little north of them near the Zambezi were deserted in his day (Dos Santos wrote in 1609). Inyanga and the Niekerk ruins, however, cannot be *considerably* older than Zimbabwe, as they constitute a series of which Umtali is the most southern link, and at Umtali was discovered a building which possessed the characteristics of the developed Zimbabwe style, as well as a fragment of mediæval ware. Kaffir articles were found in abundance on these northern as well as on the southern sites, there was no superposition of periods, and the details of the building, as well as the objects found, were of native African kind.

Having referred to a Portuguese writer, I will conclude this account by stating that while the Portuguese penetrated so little beyond the Zambezi and the coast that it was not to be expected that they would be able to give any account of the buildings in the interior, yet there are extant two passages which support the inferences that I have drawn from excavations. They state explicitly that the houses of a Monomotapa in 1506 were of "stone and clay" (Alcaçova), and that buildings described as similar to the elliptical temple of Zimbabwe were actually being inhabited by the "captains" of the "king of Benomotapa" in the sixteenth century (De Goes).

If I have spoken very positively upon the antiquity and the origin of the ruins in Rhodesia, it is because I regard these questions as having been decided by the results of my field-work. On the second part of the theme which is to be discussed, viz. the character of the foreign intrusions on the East Coast of Africa and the date to which they should be ascribed, I speak with much more diffidence, since I bring no new or expert knowledge to bear upon it. The authorities are accessible to all, and have been studied by others more closely than by myself. Yet I may venture to draw attention to one or two points. It is not always appreciated that there is little documentary evidence, and there is no archæological evidence extant to prove that the civilized world had any considerable knowledge of, or intercourse with, East Africa prior to the time of Mohammed. The dates of the Arab and Persian settlements, which the Portuguese of the sixteenth century found lining the coast from Cape Delgado to Cape Guardafui, are known from the chronicle of Kilwa. The most ancient is Magadoxo, which was founded not earlier than the tenth century A.D. Sofala itself, as the chronicle states, was first colonized from Magadoxo, and there is, therefore, no justification for ascribing to it an earlier date than the eleventh century

A.D. That in the days of the Roman Empire the Mozambique coast and the Zambezi were beyond the ken of geographers seems apparent both from Ptolemy and from the Periplus of the "Red sea." For the identification of the sites mentioned in these two works, reference may be made to the standard authority of Guillain, who considered Rhapta, the most southern place mentioned, to have been situated on the Rufiji—that is to say, in 8° of S. lat. The documentary evidence, therefore, on the one hand, absolutely forbids us to suppose that Arabs, or any other people known to the ancient geographers, penetrated as far south as Cape Delgado; and, on the other hand, it is too defective to justify the inference frequently drawn from the mere catalogue of place-names, viz. that any considerable trade existed in Græco-Roman times, even with what is now British and German East Africa. Until the spade of the explorer comes to our assistance, we can only safely affirm that these countries were not absolutely unknown at that period. *À fortiori*, if I would suspend judgment with regard to so late a time as that of the Roman Empire, I refuse to discuss anything so shadowy as the possibility of a yet earlier trade with any country further south than Somaliland, the Punt of the Egyptians.

Ethnological data are not in any way inconsistent with this attitude. Granting, what seems to be the case, that the racial type of the peoples at present existing all down the East Coast betrays Semitic *métissage* in varying amounts, yet it cannot be proved that south of the equator the intrusion of this foreign racial element is not comparatively recent.

Before the discussion, the Chairman (Sir Thomas Holdich) read the following communications:—

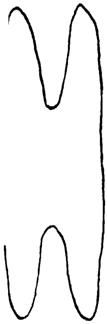
From Dr. Arthur Evans, F.R.S.: My opinion on the question of Zimbabwe can have no special value. I know nothing personally of that part of Africa. On the other hand, I was long ago negatively convinced that the supposed evidence of early contact with Arabia or Phœnicia had no real basis. In fact, it seemed to me that there was nothing in the architecture or the remains discovered in common with either early Arabian or Phœnician models as far as they were known. On the occasion of a lecture by Mr. Hall at Oxford, I pointed out the great presumption that there was that the existing ruins were simply enlarged examples of native kraals. I regard Mr. MacIver's researches as having been carried out by the true scientific method, and, so far as the dating goes, I think that he has made out a satisfactory case for their late mediæval origin. But I have not the local knowledge to express myself in any other than in general terms.

From Prof. J. W. Gregory, F.R.S.: Looking at the date of the prehistoric mining in Rhodesia from a mining point of view, it is certain that some of the mines were modern, but that others may be of considerable antiquity. It is clear, from their size and extent, that a large amount of gold has been derived from them, and by mining methods unlike those adopted, to my knowledge, by any uninstructed negro people. That the original mining instructors were either Phœnicians or people under Phœnician influence, is supported by the shape of their ingots. They were "astragali," to use the term by which Diodorus described the tin ingots obtained by the Phœnicians from Cornwall. The shape of Cornish

astragali is known from the specimen dredged at the entrance to Falmouth harbour and described by Sir Henry James.* Its form is shown on the accompanying figure, for comparison with the cavity of an ingot-mould found at Zimbabwe and now in the Capetown Museum. For the opportunity of measuring it, I am indebted to Mr. Wm. Sclater.

It seems to me improbable that negroes in East Africa should have stumbled by chance on the same pattern of ingot as those which the Phœnicians used in Cornwall; so that, whoever actually built Zimbabwe, it seems probable that there are traces of Phœnician influence on the early mining industry of Rhodesia. This resemblance has been previously remarked by Bent.

1

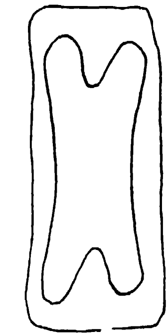


1, TIN INGOT, FALMOUTH.

Dimensions.

Length, 2' 11"; width, 11"; thickness at the centre, 8".

2



2, INGOT MOULD, ZIMBABWE.

Dimensions.

Length of mould, 7"; width, $2\frac{7}{8}$"; thickness, 2"; length of cavity, $5\frac{9}{16}$" left-hand side; length of cavity, $5\frac{6}{16}$" right-hand side; maximum width (near ends), $2\frac{1}{8}$"; minimum width (middle), $1\frac{1}{4}$"; maximum depth, $\frac{3}{8}$". The outer shape of the mould is approximate.

Dr. KEANE: I should like to make a few remarks, first on the very imperfect way in which Mr. MacIver has presented the case, and secondly upon the second part of his theme, which he has scarcely presented at all. I refer, in the first instance, to those objects on which the Semitic school builds its first argument. Such are the conic tower and the other smaller cones, the slate beams, the birds, and the phalli, and other such objects which are not found anywhere else in Africa, which the Africans would be quite incapable of making, and which, on the other hand, point most directly to Semitic worship as known to us from the remains in South Arabia, in Syria, in Sardinia, and elsewhere in the Mediterranean lands. All these objects are passed over in absolute silence, as is also the drainage system, which reminds us much more of the Roman Cloaca Maxima than of any similar structures which have ever been constructed by the aborigines. I come now to the mines, to the gold workings, which are admittedly in intimate association with the monuments above ground, and are fully described by Bent, Maund, and others. Maund refers to the tens of thousands of slaves who must have been at work in the mines, and the millions of tons which must have been overturned in their search for gold, of which some seventy-five million pounds sterling are stated by good judges to have been recovered from these workings. Mr. J. M. Stewart also speaks of the numerous workings which are mentioned in my 'Boer States,' p. 43, and which show that centuries ago mining was practised on a most extensive scale, that vast quantities of ore had been worked, and that by "engineers of a very high order." During his look around, has Mr. MacIver discovered any aborigines who could be described as engineers of a very high order?

On the second part of his theme, the knowledge or ignorance possessed by the

* 'Note on the Block of Tin dredged up in Falmouth Harbour.' Stanford: 1863. 11 pp., 4 pl.

ancients of the southern regions, Mr. MacIver makes the hazardous statement that the ancients, even so late as the Roman Empire, had no knowledge of those parts, and he refers in proof to the Periplus of the Red sea, which in those days meant the Indian ocean. On the Periplus fresh light has recently been thrown by Eduard Glaser, who has discovered that it was composed by a certain Basil of Alexandria, who was evidently much interested in the trade of the Far East. This Basil describes the navigation of the east coast of Africa down, not merely to Cape Rhapta, but all the way to the extremity of the continent. He mentions the island of Menuthias, which must be absolutely identical with Madagascar. There were large rivers teeming with crocodiles, and there were also wickerwork weirs for catching fish, a description which tallies with Madagascar and with no other island on the east coast. He says, further, that the Indian ocean trended round westwards, and eventually mingled with the waters on the other side of Africa—that is, the Atlantic ocean. Now, Basil lived in the time of Nero, consequently it was then known that Africa was an island. But it was also known to be an island long before that period. Herodotus, who is often misquoted on this point, tells us plainly (iv. 42) that King Nechos, about 610, equipped an expedition conducted by Phœnicians, who sailed round Africa in three years and came back by the Pillars of Hercules to Egypt, having started from the head of the Red sea. He says, moreover, that Africa was thus proved to be περίρρυτος, which means circumnavigable, all except the isthmus of Suez; and he further adds that Nechos proved this for the first time. What he disbelieves was, not the circumnavigation, but the statement of the circumnavigators, that they had the sun always on their right hand, which, of course, he could not then understand. There is just one other point. I mentioned in the introduction to Mr. Hall's 'Great Zambabwe,' and also in 'The Gold of Ophir,' that the ancients were well acquainted with Madagascar and had continuous intercourse with it at a very remote period, and I am now glad to say that I am supported in this statement by M. Grandidier, who is *facile princeps* in everything connected with the subject of Madagascar. He writes me that he has proof that they were connected with the Comoro islands, and that colonists were sent out, not only from South Arabia, but from Idumea, who settled in those parts. And mention is made by the author of the Periplus of the "Fire men," a most appropriate epithet for the inhabitants of these Comoro islands, where active volcanoes still exist almost in sight of Rhodesia. Therefore, there was no conceivable trouble for the Arabians and the Phœnicians, who had fleets in the Indian ocean, to reach these regions in quest of gold.

Mr. R. N. Hall: Mr. MacIver's paper is noticeable for certain omissions. In the main Mr. MacIver has fixed upon certain ruins, Dhlo Dhlo and Khami, as determining the general character and age of the whole of the ruins in these territories, which groups seven years ago were shown by Mr. Neal, Dr. Schlichter, Mr. Telford Edwards, and myself not to possess any claim to remote antiquity. He gathers the whole of the ruins into one class, notwithstanding that it is admitted by archæological experts, and by architects and practical builders, that there are widely varying styles of architecture, plan, and construction, each type occupying certain defined areas, and each yielding relics only found in such particular type of ruin.

Also, in his description of any one ruin, say Great Zimbabwe, he passes as belonging to one alleged Kafir period, all reconstructions and extensions, as part of the original buildings, notwithstanding such groups—Zimbabwe, in particular—show obviously successive occupations and buildings of several distinct periods. The paper is conspicuous for the omission of references to the numerous and lengthy chains of forts, which, in his block-house system, protect well-defined

routes throughout the country, and also leading towards the coast. It makes no reference to the conical tower and its allied platform and parallel passage, and to the hundreds of phalli found in the older type of ruin, and in such only where the exceptionally well-built, massive curved walls, with mural decoration, surmounted with conical towers or monoliths, or both, are directed towards the east or west. It fails to explain the alleged parallelisms existing between the architecture and construction, plan and mural decoration, of undoubted ancient buildings in South Arabia—Marib, for instance, and those of the oldest type of building in Rhodesia, and of the parallelisms, if not identity, as pointed out by Dr. Keane, existing between the hill terraces of Inyanga and the hill terraces of South Arabia. It is silent as to the undoubted evidences of a certain degree of civilization testified to in skill of building, with elaborate system of drainage and military defence, also in mining and assaying of reefs, and most emphatically and unanimously demonstrated by a very large body of expert opinion as being altogether beyond the capacities of existing Kafir races. Over 450 years ago, De Barros stated that Makalanga, "naked and savage," lived within the Zimbabwe temple, but these were so absolutely ignorant of the origin of the ruins, possessing no tradition concerning them, that they said they were erected by the devil "because they (the ruins) were beyond their powers to execute." The Makalanga of to-day say exactly the same as their ancestors of more than 450 years ago.

The paper, too, ignores the close association found in every single instance of phallus and bird, and the fact that the birds are further associated with conical towers, and that all the birds were discovered occupying an eastward position. Mr. MacIver considers the bird to be but a Kafir tribal totem; but there is no post-mediæval record to this effect, nor any traditions among the natives, with whom tradition dies exceedingly hard. The existence of any tribe with the eagle for its totem is quite possible, for there is not a single specimen in natural history pertaining to South Africa which has not been appropriated for totem by some Kafir race, tribe, sub-tribe, family, or caste.

But surely conical towers, platforms, parallel passages, carved birds, phalli, all found in close association, and never otherwise, point distinctly to some Semitic influence. The architecture, plan, and construction of buildings, the form of religious worship practised at Zimbabwe, and the methods of ancient mining in Rhodesia, and the Semitic impression on the Makalanga, all testify, so the most authoritative experts have always maintained, to Semitic influence in some period of antiquity.

Nor does Mr. MacIver explain why—if, as he alleges, our monuments are of Kafir work—such monuments should be absolutely confined to one area of the country, and why they are not to be found in any other part of Africa south of the equator. Mr. MacIver admits he paid no attention whatever to the ancient gold-mines, yet he practically suggests that the scores of millions of pounds' worth of gold extracted from the rock in the oldest mines was placed on the world's metal market in post-mediæval times. This is a suggestion unwarranted by history, research, and the evidence presented by the mines. The post-mediæval references to the gold export from this country distinctly relate to alluvial, or shed-gold washed from the river-beds. For instance, "the Kafirs from Monomotapa prefer the gold taken from the rivers to that taken from the mines."

The Arabian historians of between 900 and 1150 A.D. speak of the export of gold from Sofala as a long-established and flourishing trade. Fourteen years ago Mr. John Hays Hammond, the well-known gold-mining expert, reported that from the oldest type of gold-mines many scores of millions of pounds' worth of gold had been extracted in some very remote period of antiquity; also, that there had been

successions of gold-mining at different periods. Eight years ago Mr. Telford Edwards made an estimate—and the details of his calculations are published—that at least £75,000,000 worth of gold had been extracted from the reefs in prehistoric times. But fourteen years ago, and even eight years ago, the area of ancient gold-mining was far from being ascertained; the great bulk of the ancient mines were undiscovered, and it is very probable that this estimate was far exceeded.

The late Prof. Sir Le Neve Foster and other mining experts claimed remote antiquity for the older type of mines. They pointed out the skill in mining engineering of the ancients; that they must have been experienced in their art of mining in their homeland; and that there was great similarity between mining in Rhodesia and ancient mining in the Near East. Every mining engineer in Rhodesia has spoken of the skill of the ancient miners as altogether beyond the capacity of any present native race.

I believe the oldest ruins, and the mines particularly, represent the latest phase of a Semitic influence which existed in Rhodesia far back in remote times, possibly before the Christian era; and though it must be admitted that there are both ruins and gold-workings in Rhodesia which are only of post-mediæval origin, I am not prepared to accept the theory of the purely Kafir origin of the whole of the monuments and mines in the country until further investigations have been made into the question of the gold-mines.

Sir Harry Johnston: I have never been exactly to the part of Africa where these ruins are situated, but if my opinion is of any value, I should say my own convictions remain relatively unshaken that there was at a period at least as early as the birth of Christ—I believe earlier—an incursion into this country of a Semitic race of teachers. I cannot otherwise explain the gold-mining, the soapstone birds, the phalli, and the several other features in these remains which are so utterly unlike anything that has ever been made by any race of Bantu negroes. Neither is there evidence to show they could have been made by Hottentots. My own belief is that the presence in Africa, south of the Zambezi, of Bantu negroes is a relatively modern phase. The first violent eruption of the Zulus may have driven away the pre-Islamic Arabs, and yet not have completely caused the gold-mining to cease. It is, however, most useful to all of us that Mr. MacIver should have made a searching inquiry and have put before us an alternative view. All his arguments ought to be considered much more carefully than they can on this occasion, and not be hastily rejected. Still, I do not think his having found Nanking pottery in the foundations of one or more of these structures should induce us to give up too readily the belief that at some period of possibly more than two thousand years ago, Arabians, or people from the direction of Arabia, did make their way down the coast of Africa in the search for gold, and that they were in some way answerable for these buildings.

Mr. Selous: As I had travelled and hunted for a number of years in Eastern Mashonaland before the country was opened up by the British South Africa Company, I had seen a number of walled towns and hut foundations made of well-fitted granite bricks, which the natives said had been put together by their ancestors. I did not see the great Zimbabwe until 1890, and, being no expert or archæologist, I do not know how to explain the discovery there of phallic emblems and a soapstone copper mould; but of one thing I am quite sure, and that is, that the building of walled towns and circular buildings, and the extraction of gold from quartz, did not come to a sudden end a long time ago, nor can I see any evidence that a highly cultured civilized people ever lived in that country, who were destroyed by the sudden incursion of a barbarous race.

There is abundant evidence to show that in the countries of Makoni and Umtasa

the ancestors of the present occupants of that part of Mashonaland were living in very well-built walled towns, and Makoni's people still make offerings to-day to the spirit of Chipadzi at a well-built zimbabwe, where he is said to be buried. Makoni is said to be the direct descendant of Chipadzi. In my opinion, it was the Zulu invasions of the early part of the last century which put a stop to the wall-building in Mashonaland, and which gradually drove the Mashonas out of their walled towns to seek refuge on the tops of the hills, and which also put an end to the extraction of gold from quartz. Early in the last century Mashonaland was invaded by a horde of Swazi Zulus, then by the Abagaza, a Zulu tribe under Manikos, and in 1840 by the Matabele, who came from the west. Many old Matabele men to whom I have spoken have told me that when they first invaded Mashonaland they found the natives working for gold in the "amaguti"—that is, in the deep holes, and in 1891 a bark bucket and a bark rope were found at the bottom of a shaft 120 feet deep, between the Umfuli and Umzweswe rivers. This rope and bucket could not have been very old, and lying with them were an ordinary Mashona axe and other implements. Moreover, as late as in 1870 Mr. Thomas Baines found the Mashonas near Lo Magondis still extracting gold from quartz.

In 1882 I examined an old shaft near the Tati river in western Matabeleland, and found the roof in one place supported by seven poles made of mopani wood (the common wood of the country). I examined all these poles very carefully, and found that they all had the bark on them, and had all been chopped with the same small narrow-bladed axes that are used by the natives to-day. Near this old gold-working there used to be a very well-built circular wall, made of fitted granite stones, with a herring-bone pattern on one side of it. I am sure that the gold-working in this district was put a stop to by the Matabele invasion of 1840.

I think, too, there is strong evidence that the natives who lived on the hill behind the Great Zimbabwe and everywhere else in Mashonaland lived in huts built of poles plastered with mud and thatched with dry grass. At the foot of the hill behind Zimbabwe there are two enormous holes in the ground, and these were undoubtedly the places from which the natives dug the clay used by them to plaster their huts and make their pottery, for close to any modern Mashona village, or close to the site of any abandoned town, you will always find a similar though smaller hole for the same purposes. I never myself could see any sign of a highly cultured, civilized race of people having lived at Zimbabwe or anywhere else in Mashonaland. I walked round the top of the wall of the Great Zimbabwe, and found that it varied in breadth from 6 feet to 13 feet, and I believe that the people who built it intended to construct a circular building, but as they only worked by eye without taking any measurements, they made it elliptical. Surely if they had any knowledge of a written character, they would have had inscriptions on the soapstone pillars embedded in the walls of the fortress on the hill above the Great Zimbabwe, but there were nothing but herring-bone and lozenge-shaped ornamentations. I examined these, and nothing could have been more rude; there was not a single straight line in them. Any native could cut such patterns in wood or soft stone at the present time. Given a powerful chief in Mashonaland a hundred years ago, at a time when the natives were still accustomed to building walls of well-fitted granite stones, and I see no reason why such a chief could not have had such a building as the Great Zimbabwe put up.

Mr. C. H. Read: My contribution to this discussion will be a very short one, seeing that I have not seen these ruins myself, but I have only seen, during recent years, sundry of the remains that have been dug from them. Some years ago Colonel Rhodes brought me divers objects which had been found under similar conditions to those described by Mr. MacIver. But with regard to these, I may say

nothing that was brought to me differed from what might have been made either by the existing or recently existing natives, except in cases where they were importations of a well-known date. That is to say, there was Arab pottery and Chinese porcelain, such as Mr. MacIver has found, but nothing dating from an earlier period than about the thirteenth century. Now, we know that Mr. MacIver has made systematic excavations on, I think I may say, sound archæological lines. We have, therefore, relics which can be readily dated within a century, or even closer, no one of which (the imported articles) can be placed to a more remote date than, say, the thirteenth or twelfth century. The point before us is, are the ruins B.C., or do they belong to mediæval times? That is why there is no particular reason to bind one's self to the thirteenth century when it might be the fourteenth. With regard to one of the pieces of inscribed pottery shown on the screen, the writing upon it was dated, from the character of the script, as being about the fifteenth century. The character of the ware, however, would lead me to place it somewhat earlier, perhaps the thirteenth. They are the oldest importations to which any date can be given at all. All the Chinese porcelain is of a later date, it may be of the fifteenth or sixteenth century. Therefore we have these importations of a known date. As to the native objects, the assegais and so on, there is no need for me to speak about them here, because there are many gentlemen who know them far better than I do; but so far as I can see, there is nothing that might not well have belonged to the recent predecessors of an existing race in that part of Africa. Now we have these imported objects, which are more easily dated than native articles. We have them found in a definite position with regard to the construction of these ruins. As the foundations were made first, and these are part of the foundations, the superstructures, as Mr. Selous pointed out, must necessarily be subsequent to the date of the objects found in the foundations. That is really the kernel of the whole situation; that is the positive evidence. Now for the negative evidence. I have never heard of any series of ruins, spread over a wide extent of country like this, and assumed to have been erected by a civilized race, who have not left one single relic of any kind that is comparable with, let us say, the civilization of the Mediterranean area, or what is known of Arabia. There is not, so far as I have ever heard, one single object that can be set down as belonging to any civilization of any of these northern people at a period, say, before Christ. That is the negative evidence, and, taking the two together, one cannot set down these ruins as being erected by any civilized race from the north or at a period antecedent to the Christian era.

Mr. H. Balfour: I do not think that I can add materially to this interesting discussion. My own opportunities for visiting the sites of the ruins in Rhodesia were very few. I was able to pay a brief visit to Khami, and I made a three-day stay at Umtali, spent principally at the ruins with Mr. Andrews. In comparing these two sites, I could not but be struck by their individuality, as exhibited both in their general characteristics and in certain points of detail. The presence, for example, at the Umtali ruins of numerous curiously engraved and otherwise decorated stones of large size, and the numerous finds of steatite figurines, furnish a striking feature which is not paralleled at other similar sites. The abundance of rude flint flakes and implements at some of the ruins, associated with the iron tools of native manufacture, and their scarcity on other sites, is another feature worthy of further investigation. I have recently (in *Man*, February, 1906) suggested an explanation for this, but further work is required. Although the various sites bear undoubtedly striking resemblances to one another, showing their certain relationship, yet the divergences are equally important, and I gather, from the descriptions of Mr. MacIver and others, that this individuality extends more or

less over the range of the ruins. It is evident to me that it is of the greatest importance that renewed investigations should be undertaken, and that each individual site should be worked out as thoroughly as possible, before final generalizations are made upon the whole group.

Personally I sympathize strongly with Mr. MacIver's conclusions, and I consider that the results which he has arrived at by unbiassed archæological methods are conclusive as far as they go; but I still hold that there are yet important details requiring explanation, and on these grounds I think that it is extremely desirable that further work of a highly organized kind should be instituted. What we seem to require now is an organization somewhat similar to that of the Egypt Exploration Fund, which would enable the work to be conducted under the supervision of a highly qualified organizer, and to proceed during a period of years, until a sufficient amount of evidence has been obtained. The problem is none the less interesting for having been to some extent transferred from archæology to ethnology, and it remains just as worthy of detailed investigation as before.

Dr. HADDON: Mr. MacIver has not had time this evening to give us all the data he has collected. In Bulawayo he informed us he had seen a large number of buildings in which he could trace the gradual evolution of such a complicated building as that of Zimbabwe from a simple kraal. It seems to me that the whole of the evidence of the ruins should be considered, as all the remains are associated; it is unfortunate that Mr. MacIver's time was too short to enable him to study the gold-workings and what has been described as a chain of forts, but as his opportunity was limited, he wisely confined himself to the more important buildings. I heartily agree with Mr. Balfour that a society or association should be formed to examine the problem thoroughly in all its aspects. With regard to the phallic emblems obtained from the old ruins, I may state that I saw in a Makalanga hut a couple of clay breasts on the interior of the wall, showing that a magical practice connected with reproduction is carried on at the present day. There is one question which perhaps Mr. Selous could answer. It is whether any local Bantu chief, or king, ever had sufficient power to organize labour of this kind? I am perfectly aware a chief could organize warfare—fighting is a game most men like; but is it likely he could enforce the tremendous amount of hard work that was necessary to exploit the gold-mines?

Mr. SELOUS: Any Zulu chief could have commanded 10,000 men.

Dr. HADDON: And make them work in the mines?

Mr. SELOUS: Oh yes.

Dr. HADDON: That seems to me an important point, because some one, a Makalanga or other chief, must have had a considerable amount of power to do this, as well as to build the forts and keep open the trade routes.

Mr. D. G. HOGARTH: I quite agree with Mr. Read, who is really the only speaker, so far, who has addressed himself to the subject from an archæological point of view. The most important point in Mr. MacIver's paper, from an archæologist's point of view, is the section which he cut at Zimbabwe. Mr. Hall said nothing about it. I should be glad if Mr. MacIver, in his reply, would be very precise and tell us whether it is certain that he actually found pottery under foundations, or whether he found it where these had been removed.

Mr. MACIVER: Absolutely certain.

Mr. HOGARTH: That is what I want to know, because on this pottery depends a very great deal. I would remind the meeting that if that lowest building in the elliptical "temple" goes, the elliptical "temple" goes with it, and the bottom is knocked out of the Semitic theory. It is on the elliptical temple that the whole Semitic theory centres. It rests also on a great deal of vague generalization. As

Mr. Read says, we have no other evidence of Arabians or Semites here, and it is not conceivable that these would have left no positive evidence of their presence. For instance, there is not a scrap of their writing. And there is another fact which I wished to mention at the Geographical Society some time ago, and that is this: A great deal has been said about South Arabian buildings in this connection, in spite of the fact that we practically know nothing about them. We have never had any published photographs of the Marib ruins. They were not even seen by Dr. D. H. Müller, who has been quoted by Mr. Hall. He endeavoured to get there some years ago, but the party quarrelled, and he barely escaped with his life down to the coast. These buildings may or may not have an analogy with those Zimbabwe buildings, but in quoting them we have been dealing with an unknown factor all the way through. My own view about this problem, if it is worth anything, has been pretty definite for some years. I was not convinced by Mr. Bent's evidence. I was always very much impressed by two facts: one that no real evidence of high civilization was offered, either by the architecture, or still more by the smaller finds, particularly those much-vaunted steatite phalli and birds. Of course, steatite is the easiest stone that is worked by man, and the work that was done in this at Zimbabwe was far below the present work of the inhabitants of New Guinea. I hope that the result of this meeting will be that more attention will be paid to definite archæological evidence such as can be gained by scientific investigations; such evidence as I think, to a great extent—though I agree that the whole area has not been covered—has been gained by Mr. MacIver; and less attention be paid to assumptions in this matter. If you will read Mr. Bent's book and other works upon this question with care, you will see that the sanctity of the elliptical temple was always assumed at the start, and practically almost everything—every generalization which has been drawn about the things found in that curious and irregular area, rested upon this assumption. If I may add one other thing, I would ask Mr. MacIver, in his reply, to say whether he has any theory about the erect monoliths. I admit they may signify almost anything, but it is possible he may have formed some definite theory as to the purpose for which they were put there.

Mr. J. L. Myres: There is one point which I perhaps misunderstood, and I should be very glad if Mr. MacIver in his reply would make it clear. He gives us in his paper evidence that the cement platforms come right up to the inside of the big walls of Zimbabwe and of these other buildings, and he mentions instances in which they come right up to the outside. The only weak point which I think the critic might conceivably find in that proof is as to the exact relations between the walls and their immediate foundations. Does one get anything to suggest that the earliest platforms inside and outside the wall really go back to the period of the walls themselves? He makes use of the analogy of water frozen into a glass or the molars in a jaw, but that does not prove anything about the relative age of the water and of the glass; so I am not quite clear that his proof of the age and composition of the cement deposits is complete.

Mr. L. Doncaster: I have no justification for addressing the meeting, except that I was at Zimbabwe after Mr. MacIver was there. I am not an archæologist, but it did not seem to me to be certain that Mr. MacIver had got to the foundation of the outside walls at Zimbabwe. It seemed to me that the proof he gives that the structures inside the walls of Zimbabwe are comparatively modern need not necessarily apply to the walls themselves. I saw and examined the trench of which he gave a photograph. There is no doubt it goes under a small very badly built wall, and underneath that wall there is clay with ashes and pieces of charcoal, and teeth of oxen very well preserved and obviously fairly new. But it did not go under——

Mr. MacIver: Do you mean below the level, or do you mean passed underneath?

Mr. Doncaster: Below the level; so far as I could see, the foundation was nowhere exposed.

Mr. MacIver: I must correct you. That trench went underneath no wall; it was in Section 15, and ran north and south.

Mr. Doncaster: There was a little wall.

Mr. MacIver: Yes, but my trench did not run under that. I merely dug there to see what it was. It did not run underneath; it started at that point.

Mr. Doncaster: Yes, so that you can see the wall was built upon clay containing bones and teeth.

Mr. MacIver: The statement will pass.

Mr. Doncaster: It was not near the great wall outside. I saw no evidence that Mr. MacIver had exposed the foundations of the main wall.

The Chairman: If no one else wishes to make any remarks, I will ask Mr. MacIver to reply shortly to the questions which have been raised.

Mr. Randall MacIver: The ground covered, of course, has been exceedingly wide, and it has been a very great relief to me to find in the last three speeches that one seemed at last to be getting to grips. I had wished from the start to have this discussion closer, and to be able to answer every objector one by one. As it is, we have acquired a great deal of useful information, but several of the speeches, much as I have learned from some of them, have shown a totally false conception of what is the logic of these things. It is, as Mr. Hogarth put it—and he has virtually answered the most important of my objectors—entirely an archæological question. I had hoped to be cross-examined about the sections and about my field work, and not to be assailed with vague generalizations about what might conceivably have happened under certain geographical conditions. I answered Mr. Hogarth, interpolating in his speech, that the decisive objects were found directly underneath the foundation of the huts, and not merely below their level. Mr. Myres' point is a valuable one. I am quite certain that the cement platforms belong to the walls. I used the analogy of water frozen into a glass, and that applies to a place like Dhlo Dhlo or Nanatali. The fitting is so exact that the cement must actually have been made to go into the stone. At Zimbabwe are still better examples, because there the cement goes outside as well as under the walls. Mr. Doncaster, of course, gets on to the same point: Had I got to the bottom of the walls? Yes, the section which I particularly referred to in the elliptical temple, the section in enclosure 15, was in the very lowest corner of the temple, and when I got down to bed-rock I could not get to anything else, and I was several feet below the main walls there.

Taking my other objectors one by one, Prof. Gregory refers to the ingots. Well, that is a very small point. If Prof. Gregory knew his Portuguese authors, he would find there is a reference to natives making ingots in the form of a cross. As a matter of fact, this shape of ingot is found in various parts of the world, and has no doubt been adopted on account of its convenience for tying into loads. Prof. Keane maintains that the conical tower, the birds, and the phalli are not African, but Semitic. Mr. Hogarth has dealt with the matter of the birds; they are of extremely rough work. The suggestion that they have any Egyptian character is simply ludicrous. As to "phallic worship," authors have spoken exceedingly loosely about it, and have never defined what it means. If there is to be any sense in terms, you cannot describe as "phallic worship" anything in which an anthropomorphic deity is concerned. But it is to be observed that in any case the rites which most nearly approach to anything like phallic worship are found amongst *native African* peoples, viz. the Ewe-speaking tribes of the West

Coast. In which connection I may remark that the famous "zodiac" belongs to a class well known from the West Coast, and the bells found by Mr. Hall at Zimbabwe suggest the same provenance. Prof. Keane, when he mentions misquotations and misunderstandings, reminds me there is both a misquotation and a misunderstanding in his interesting book on the 'Gold of Ophir.' The reference is on p. 162. Referring to Bent's statement that he had found a bowl inscribed with certain characters, Prof. Keane reproduces five characters, and from the terms in which he writes, leaves the readers to suppose they were inscribed on Bent's bowl. But they are the letters of the proto-Arabian alphabet, and taken from the alphabet, and not from Bent's bowl. I would not have referred to it, but the misconception has found its way into other books, and this sort of evidence ought to be checked. There are seven mentions of ruins in the Portuguese chronicles. The Portuguese did not get very far into the country, and you can work out exactly how far they did get in. I have been through all the Portuguese chroniclers very carefully; they are to be found in Dr. Theal's 'Records of South-Eastern Africa.' There are two references to Zimbabwe, and it has apparently been overlooked that one of them settles absolutely that the buildings were inhabited in the sixteenth century, when the author wrote. The writer is De Goes, and the reference may be found in Theal, vol. 3, p. 109: "In other districts of the said plain there are other fortresses built in the same manner, in all of which the king has captains." The "king," as appears from the context, is the "king of Benomotapa." This is in agreement with what Mr. Selous was telling us. I have been taken severely to task for not dealing with the mines. I had not the slightest intention of doing so, because I knew that I could not obtain sufficient archæological evidence from them. But there is a great deal on the subject to be found in the Portuguese writers, and it is of some interest. I have put together, in my report, some notes as to the actual output of gold. Of course it is exceedingly difficult to get any exact estimate of what has been extracted. Let us, for the sake of argument, take the suggestion which puts it at 75,000,000. A Portuguese writer (Alcaçova) states the yearly sum being taken out at the very beginning of the sixteenth century. Translated into English money, it was somewhere between £109,000 and £140,000 sterling. It would not take many centuries to run up even to such a figure as 75,000,000 at that rate. I think I have nothing further to add, except to say that of course this is not a full account that I have been able to put before you. I have done my best to bring a good deal of evidence before you in a short space of time, and I am exceedingly obliged to those gentlemen who have been so kind as to support my opinion, and not less obliged to those who, by opposing me, have brought fresh light to bear upon the subject.

The Chairman (Sir Thomas Holdich): I can only express my regret that for a discussion so interesting as this has been we had not a little more time. I think it might well have been extended over two meetings. I think the general sense of the meeting appears to be in support of Mr. MacIver's contention, but there have been such divergences of opinion expressed that I quite agree with what Mr. Balfour has said on the subject of further investigations on the lines he suggested. I can only say for myself that if ever such investigations can be carried out, I hope they may be collated with other investigations on the further side of Arabia, where there are, extending along the coast from Beluchistan to the Purâli river, which in the time of Herodotus was called Arabis, a great number of ruins still awaiting research by the archæologist, which I believe are due to the building capacity of the Himyaritic Arabs. At the present we have nothing more to do than to thank Mr. MacIver for giving us a most interesting address leading to a discussion which I think will be productive of further interest in the future.

Colonel H. W. Feilden, who was unable to attend, sends the following remarks on Mr. MacIver's paper: My personal acquaintance with the ruins of Rhodesia is confined to those of Khami, near Bulawayo. I visited them last year. These buildings do not seem to me beyond the intelligence of native African tribes to construct. At the same time, is it not hazardous to deny that those who built these "cities" were not influenced by an ingraft of a higher civilization from without? Do we not possibly underrate the traffics and discoveries of the ancients, and the influence they may have exerted by contact with the barbarous inhabitants of South Africa? But my object in joining in this discussion is to draw attention to facts which seem to have been overlooked, or touched on very lightly. The enormous *débris* mounds, covering many acres, surrounding the ruins of Khami, have been raised by a people largely using stone. Implements of stone, such as flakes and cores, are to be met with in thousands; in fact, hardly a stone I picked up, even on the surface of the *débris* mounds, failed to show the handiwork of man. This suggests that the inhabitants of Khami could not have been in a very forward condition of civilization.

I do not suggest that the presence of a partially stone-using population necessarily entails remoteness in time for the building of Khami. I find without doubt that a stone-using people of Bushman-Hottentot character lived on the shores of Table bay and False bay at the time of the first occupation by the Dutch. In their kitchen middens, relics of European wares are mixed with the stone implements of the chase and of their daily use. These stone implements are Neolithic in type; so are those at Khami. There is a Palæolithic and Neolithic period observable in the Stone Age of South Africa. I am not prepared as yet to draw a line of demarcation between these periods; probably they inosculate. A great lapse of time must have elapsed between the Palæolithic race, which has left abundant traces of its workmanship in the high-level river gravels of the Zambezi valley, deposited before the Victoria falls and the chasms of that river were carved out, and the builders of Khami. I have ventured to draw attention to the stone-using character of the people who raised the *débris* mounds of Khami, in the hope that the future explorers of the ruins of Rhodesia may pay greater attention than has hitherto been done to this interesting and perhaps elucidating subject.

ANTHROPOGEOGRAPHICAL INVESTIGATIONS IN BRITISH NEW GUINEA.*

By C. G. SELIGMANN, M.B., M.R.C.P., and W. MERSH STRONG, M.A., M.D.

From the Alcesters we sailed to Murua, where at Bonagai there are some hundreds of feet of coral rock. Beneath this in places is a bluish rock. From this rock, when it has become altered and softened often

* Continued from p. 242. After the first part of this paper had appeared in print, I received a note from Dr. Strong, in which he states that—

(1) The mountains called the Tully peaks in his map of the Mekeo and Inauvorene districts (published in the March number of the *Journal*) are probably incorrectly named.

(2) On comparing the barometer used on his trip with the boiling-point thermometer, the former was found to be much in error, so that all heights are incorrect.—C. G. S.

to about the consistency of mud, gold is obtained. Some 7 miles from Wanai bay, where we anchored, proceeding towards Mapas island, the hills tumbling to the shore consist of several hundred feet of a bluish dolomitic limestone, fretted everywhere into pinnacles, and carrying only a flora of scrub and small trees. This was the site of a number of not very recent cliff burials, and we found a large number of bones, often placed in pots deposited in the shallow caves and limestone fissures. A few of the bones were painted red, and one skull had a pair of turtle-shell earrings slipped on to its zygomata.

Mapas island, over which towers Suloga peak, lies some 7 miles to the east of that site of these cliff-burials, and here, in the position

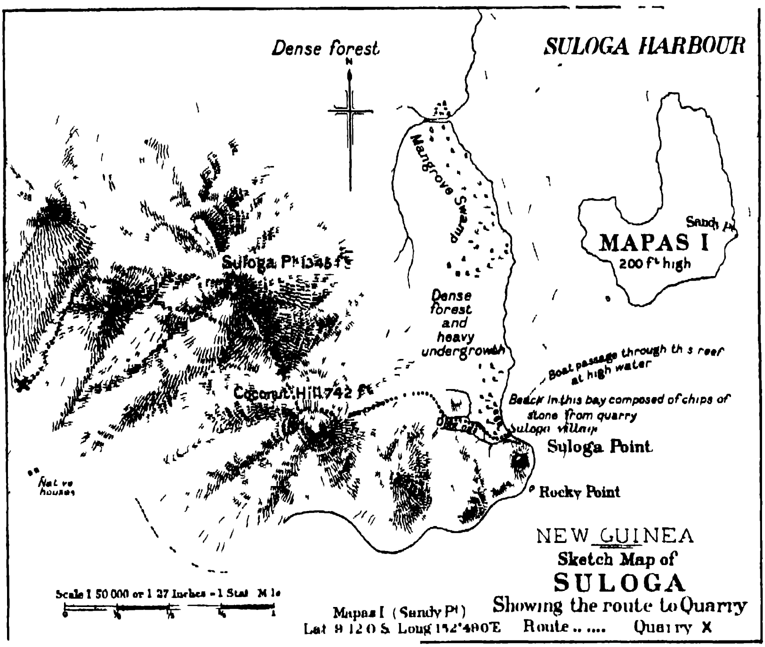
SULOGA VILLAGE. BEACH COMPOSED ALMOST ENTIRELY OF FLAKES.

indicated on the sketch, we come upon a portion of the sand beach covered inches thick with flakes and chips, a residue which only generations of stone-working could have produced. Here we made our camp, beside the two-house hamlet which is all that now remains of the two formerly prosperous and popular Suloga villages. Inquiries showed that the quarry lay somewhere on the seaward flank of Suloga hill, though it was by no means easy to find an adequate guide.

On leaving the beach the track led across half a mile of flat land, behind the mangrove belt, only a little elevated above the sea-level, thickly bushed, and with some great gaping red wounds where alluvial gold-mining was being carried on in the iron-impregnated soil. "Float"

and doubtful outcrops of a stone closely resembling the common implement material were plentiful as we climbed. The rise was sharp and fairly even till, after a stiff scramble, the crest of Coconut hill (Wanakwaiin of the natives) was reached. This is a continuation of Suloga peak. Here, at an elevation of about 700 feet, was a natural clearing, one of those curious places, common in New Guinea, where trees do not grow, and from it Suloga harbour and the coast to the eastward lay map wise below us.

This open space was some acres in extent and marshy, with plenty of chips lying about, and two remarkable standing stones of which we could



get no explanation. The bush on the opposite sides of this open space was, in the childhood of men now old, occupied by two large villages—Wandari to the north, and Maied to the south—whose folk in the old times had been the custodians of the 'quarry," and through whose hands its output passed. They chipped stones into rough shape, and bartered these (for there was a large trade in the unfinished article), or wrought them to laborious perfection on grindstones of granitic-looking rock, which we found lying along the track near their former dwelling-places The largest are great blocks, some well over a hundredweight, with deep saucer-shaped depressions where the grinding

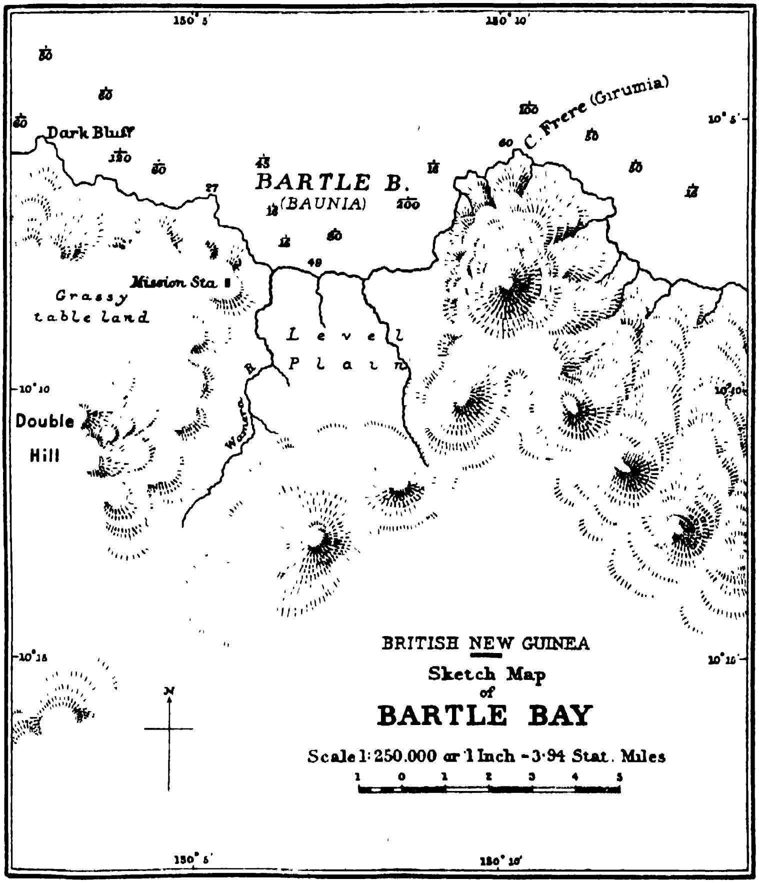
had worn them down. The whole hill is deserted now, and the old village sites thickly covered with young jungle. About thirty years ago an epidemic swept the villages nearly clean, and with the dead died the art of making stone implements. The few survivors fled to the present two-house beach village of Suloga, or, by one account, went first to the other side of the bay, and later came back to their present position.

From the natural clearing on Coconut hill we walked north along the crest of the ridge through a few hundred yards of second-growth bush, where lay the old site of Maied village. Here stone chips were plentiful, and among them many stone implements in the earlier stages of manufacture, together with a few further advanced, but we found

A PORTION OF THE OLD REEF FACE EXPOSED ON THE HILLSIDE TO THE WEST OF BARTLE BAY

no finished or nearly finished tools or benam. Beyond was another strip of open country, rising sharply to the crest of Suloga peak, which is itself covered with heavy bush. This open space was sparsely grassed, the soil being a red sandy clay, above which protruded many detached boulders and what appeared to be true outcrops of rock apparently identical with the material from which stone implements were commonly made. Flakes lay everywhere, literally acres of flakes; not scattered specimens, but in compact sheets having a thickness measurable at least in inches—plain evidence of a vast amount of work extending over a considerable period of time.

Soon we bore to the left, plunging into the thick bush of the peak's western face, and following a most fallible native guide, who led us far and near over ledges of volcanic rock and tumbled boulders, till at last, after a long rugged traverse of the mountain's flank, we came to the place of our desire. The steep slope breaks away suddenly in a half-circle 100 yards wide and perhaps 30 yards deep, down whose



nearly perpendicular sides we scrambled to a creek-bed all boulders and ledges of tool stone, and showing frequently the curious narrow streaks and bands of lighter-coloured material which, running lengthwise of its blade, give the perfect benam its last attribute of value and beauty in the natives' eyes.

No doubt stone was taken everywhere from along this creek; but

we had to follow its course down to an elevation of probably not more than 250 to 300 feet above the sea, and scarcely half a mile inland, before the traditionally most important place was reached. Here the little stream raced for more than a hundred yards in a trough formed by two remarkable rock masses. A smooth table of tool stone quite 25 feet wide was canted downhill at an angle of about 15°, and also tilted to the left at an angle of 25° from the horizontal. Its upper edge is bordered by the jungle; its lower edge meets and fuses with a straight smooth cliff of the same rock, some 18 feet high, with a slightly under-cut base which rises nearly at right angles to the table-shaped stone. At the foot of this cliff for its whole length runs a series of bands, some very narrow and others several inches wide, of the lighter-coloured material.

There was no evidence anywhere of quarrying in the proper sense of that word. The descriptions we were able to gather of old-time methods of work gave no hint of anything of the sort; and the extreme hardness of the stone makes the idea at least *prima facie* unlikely.* Furthermore, no real quarrying was in the least necessary, for the creek's bed just above the ledge is still full of broken pieces of beautifully marked stone, quite manageable in size, which the natives said used to be broken into workable fragments by dropping one upon another from as high as a man might lift. A further supply of material is found along the creek's right bank, where, butting on the edge of the table rock, are a number of rather compact masses of smaller stones, so curiously shaped and placed that for a time it seemed that they might be, as the natives said, implements in their very earliest state together with large flakes and cores. A closer examination of these heaps made it plain that, while a few of the surface stones might be artifacts, the bulk were the natural product, still *in situ*, of weathering, or of some fairly recent movement of the hillside's upper *débris*.

The table rock, and the cliff bounding it on the left, both end suddenly in a terraced drop of some 50 feet; after which the character of the valley, and especially of the sections cut by the stream, is so changed that a different geological formation seems to intervene. There was not time to go further down-stream than the lip of this fall; and it was while returning from examining it, and at a place where the surface soil had fallen away, that a mass of stones was seen similar to those butting on the table rock higher up, but in this case presenting clear evidence of having been produced *in situ* by natural causes.

The day after visiting the quarry was spent in collecting such information as is now obtainable about the disused quarry and the lost

* Sir William MacGregor, who visited the quarry, states, "They [the natives] break out stone, and it is said also split up the rock, by fire" ('British New Guinea and its People,' p. 12. London: 1897).

art of stone-working. The first breaking of the stone seems to have been a very chance affair, when pieces already broken by natural causes to some nearly suitable shape were not found ready to hand. The ultimate shape of the implement, whether it was to be adze, chisel, or benam, though it depended greatly on the workman's skill in cleaving, was undoubtedly assisted by the careful selection of a not too unkindly fragment to work upon. It is evident from this how it was that really choice benam, properly broad and thin and well marked, got part of their value from rarity of material—that is, from the scarcity of suitably shaped rough stones. For to make a benam from even the most promising bit of material must have required great perseverance and labour, while to have made one from a frankly unsympathetic beginning would be an appalling task even for Papuan patience and skill. The actual flaking is alleged to have been done with spherical water-worn stones about from 2 to 3 inches in diameter. These are found near Suloga, in what from the description one would guess was an old river-bed, and each consists, according to Mr. Fearnsides, of the core of a spheroid of gabroid dolomite.

Free flaking was the method by which implements were roughed out, the flakes occasionally being of such size and shape as to make a useful adze-blade when one edge was ground. After the tool had been carefully roughed out came the grinding, which at Murua was done on flat slabs of a granite-like rock found plentifully about Suloga and elsewhere in Murua. A slab of suitable size and shape was brought to the village from wherever it might be found, but no quarrying or serious trimming was attempted, and it was a case of finding the proper thing ready-made. Sand and water were used for all grinding, but the very last—the polishing—was done with water alone, the powder worn from the two stones then forming the "tooth."

Of ancient grindstones we found some dozen in all, but without making any determined search; some on or near the sites of the two former hill villages, some on the beach where the present Suloga village occupies ground on which a much larger settlement once existed. The depressions worn into all these grindstones were circular, going to show (as tradition also asserted) that the grinding motion was round and round rather than back and forth. Many unground stones were exported, notably to the Marshall Bennet and Trobriand groups, perhaps also to the D'Entrecasteaux and Louisiades. These would then be polished locally by their new owners, who, however, failed to obtain the beautiful even polish present on the best Murua-ground stones.

Dr. Marr and Mr. Fearnsides have examined a number of flakes and rough and polished adzes derived from Murua and the Marshall Bennet group, as well as a number of adze-heads collected in the Central Division and traditionally derived from further east. The stone implements obtained at Murua fall geologically into two series—

(1) Those composed of an ash often banded, and always more or less silicified.

(2) Those composed of lava showing well-marked flow structure (rhyolite), and containing inclusions, the latter giving rise to the lighter bands.

To the first division belong a number of flakes found at Wanai bay, at a spot locally known as "Red-bluff," as well as rough unground adze-blades picked up at different spots on the track leading towards Suloga peak from Coconut hill. An unpolished adze-head collected at Gawa also consists of silicified ash. To the second class belong a roughly flaked adze collected on the track to the peak, as well as flakes picked up on the grassy area below the peak and other flakes collected on Suloga beach, as do a series of Murua-made adze-blades obtained at Iwa.

It thus seems clear that two geologically distinct kinds of rock were worked at Murua, one being a volcanic ash, the other a lava. These might be expected to occur close together, or even to form superposed strata. Both rocks may be, and at times actually are, banded, and, both being hard, we did not, until this was pointed out by Dr. Marr, appreciate that there were at Murua two quite distinct kinds of rock from which adzes were made. Hence nothing can be said as to whether the natives had a preference for either kind of stone; but, judging from the adze-heads collected, the broadest and most even bands undoubtedly occur in the rhyolite, which would thus have come to be especially valued.

In old times Murua-made implements were common over a very large territory, being traded from tribe to tribe on the north-east coast of the mainland to Collingwood bay at least, and on the south-west certainly as far as the Papuan gulf, and quite possibly even beyond.* The introduction of iron, or rather its coming into general use, would necessarily put an end to the making of stone implements for actual work, but the ending, it would be expected, would be a gradual one. Yet the Suloga people, by their own account, suddenly stopped making adzes for both practical and ceremonial use. Said an old man, "My grandfather was a famous maker of stones, who taught his son, my father, whom as a small child I often saw at the work. Undoubtedly he would have taught me as I grew up, but for the big sickness. He died, and I was never taught, nor were any of my generation." And even if a synchrony of introduced iron and a devastating epidemic killed at a single blow the

* For the northern and western extension to Collingwood bay of the province of the Suloga adze, I am indebted to the kindness of Mr. A. M. Campbell, resident magistrate of the Eastern Division, who gave the expedition a beautifully banded adze-blade of Suloga rhyolite collected in Collingwood bay. With regard to the Papuan gulf, Dr. Marr, who has examined a small adze-head I obtained at Jokea, considers this to be composed of a silicified ash identical with that of which many of the Suloga adze-blades consist.

art of making stones for use, there remains the problem of the implements not for use—the "ceremonial" benam, to give them the name by which they are known at Tubetube. These Murua-made benam had a range which spread through the south-eastern archipelagos, and extended in an easterly direction on the southern coast at least as far as Mullins harbour.

With armshells, benam which, though less than half an inch thick and exquisitely polished, might exceed 13 inches in length and 5 inches in breadth, formed the high denomination currency of the south-eastern archipelagos. Their provenance, so far as we know, was Murua only, with Suloga as the principal and perhaps only quarry, and also the chief factory for turning out the finished product. Iron, as already pointed out, may be supposed to have quickly destroyed the value of stone tools, and so killed, in perhaps a very short time, the art of making them; but benam still retain their ceremonial use, while their value, either as ornament or as currency, has certainly not diminished. They are worth more to-day than ever, and it is a mystery why their manufacture was abandoned as suddenly as appears unquestionably the case. The mere devastation by disease of the old Suloga villages is not enough to account for the sudden permanent cessation of benam-making by the survivors; since it appeared that benam were formerly made elsewhere on Murua, and perhaps even in other places among the islands from Murua stone imported in the rough. Grinding and polishing shell is still common enough everywhere throughout South-Eastern British New Guinea; but in this district the art of flaking, grinding, and polishing stone is extinct, and as loss and breakage and occasional export (but only very occasional now) make them rarer and rarer, the value of benam is rapidly increasing. The trader finds it worth while to pay from £5 to £10 in cash or in trade goods for a really good example, when he can secure one. He is sure to sell it again for a handsome profit in the course of his wanderings, taking in exchange copra, tortoise-shell, and other native produce, supposing he does not find it better worth while keeping for the prestige its mere possession brings.

Westwards and somewhat to the north of Murua lie the Marshall Bennet islands, Gawa, Kwaiawata, Dugumènu, and Iwa (Jouveney island). West of these, and distant but 9 miles from the Trobriands, is Kitava (Jurien island).

Dugumenu is described as a "low coral island about half a mile in diameter, covered by trees and coconuts." We did not visit it, as we were told at Gawa that it held no permanent population, but was rather of the nature of a coconut plantation for Gawa and Kwaiawata. The other islands of the group are all elevated atolls whose population live in hamlets in the central depression of the old lagoon bed, and there make their gardens out of sight of the sea, and marvellously sheltered

from storms. On Gawa the villages in the old lagoon bed were some 60 feet below the uppermost edge of the encircling coral wall.

The edge of the reef at Iwa has been elevated to a height of about 350 feet at the south-east extremity of the island. In the case of Gawa and Kwaiawata, the reef is about 100 feet higher than this. Only the northern end of Kitava was examined, and here the reef rose to a height of about 300 feet. On examining the sections constructed by Captain Pim, it is clear that all the islands are more or less terraced. This did not appear to us to be entirely or almost entirely due to weathering, but rather to indicate successive periods of uplift. On Iwa the terracing was particularly marked, and the ascent easy after a short almost vertical portion of the cliff face above the beach had been ascended. All these islands, then, show a marked likeness to each other, and differ only in detail, so that a good general idea of the group can be obtained by carefully considering one island. To this end, Captain Pim's account of Kwaiawata is quoted at length.

"This island is small, roughly circular, its greatest diameter being about a mile. In places it is very steep to, but a fringing reef lies off the south-east and north-west sides, and a belt of gradually shoaling sand just outside the reef affords convenient anchorage. On the east and west points of the island the cliffs come right down to the water, and there are numerous small caves to be seen along these parts of the coast; apparently some of these caves are used by fishing parties to sleep in, as mats, etc., were found in them, and places where fires had been made and food cooked were seen. The beach is composed of coral cement, with loose coral boulders scattered about, and is about 6 or 7 feet above high-water mark.

"Starting from the beach on the east side, a gentle slope leads up to the first ridge (about 20 feet above sea-level), which appears to be an old sea-beach; a slight depression follows; and then, climbing up a sharp rise, the first platform, about 100 feet above the sea-level, is reached.

"This platform, a large portion of which is covered with heavy scrub timber, leads up to the foot of a wall-like cliff, only to be scaled by ladders made and placed in position by the natives.

"The top of the cliff is 240 feet high, and a winding path, running along the edge for some distance, leads to the crest of the old reef, 415 feet above sea-level. This is by no means the highest point of this side of the island, but rather bore the appearance of being, in the days when the surface of the reef was awash, a deep-water entrance into the lagoon.

"Numerous coral patches lay scattered about, and rose much higher than the place where we were standing when the reading of the barometer was taken. I should consider they were quite 30 to 40 feet above our level, and it was strange to see how well the coral had stood

the destructive influence of the elements. I, who had passed most of my life among coral reefs, could almost fancy I was walking on one of the Queensland Barrier reefs as I looked round upon the boulders scattered about.

"From this spot we could see the floor of the old lagoon, which dipped towards the centre, giving a view of extensive gardens, with here and there a group of coconut and betel-nut palm towering above the low undergrowth, and drawing attention to the little brown houses of the native villages, whose sites they marked, and around which they were clustered.

"The parts of the central depression not under cultivation are covered with a thick, heavy, second growth of young timber and ferns, in striking contrast to the higher, larger-girthed trees of the circumferential rim.

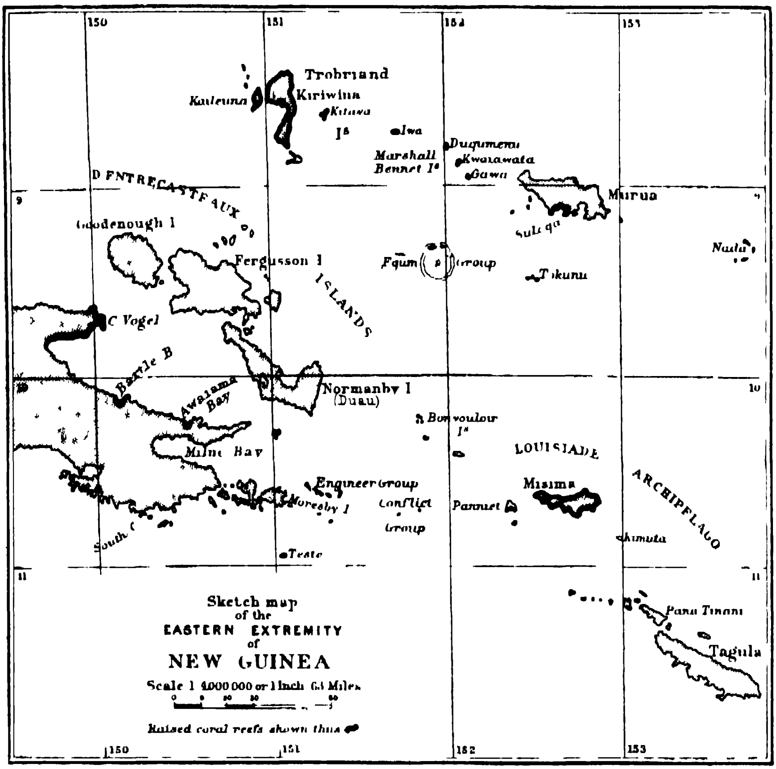
"Descending the slope, past numerous garden fences, we reached the centre of the lagoon, and found it to be 325 feet above sea-level. The soil was a rich, heavy vegetable mould, and in the villages and on the paths it was trodden into a compact mass as hard as cement, that held the water, and became so slippery with every shower of rain that it was positively dangerous to walk upon. Passing through a number of hamlets, the ground became higher and the coral boulders more numerous, until the inner edge of the old breaker was reached. The path led through a gully between two coral walls covered with high trees, and emerged at the top of a cliff which went down almost perpendicularly. The barometer showed the height to be 440 feet, and we were standing in a crevice between walls which were at least 20 or 30 feet higher. The crevice continued down the face of the cliff in a slanting direction, forming a chimney, down which the path led, and which the natives said was the only way to reach the flat below.

"Scrambling down the cliff, towards which it was necessary to keep one's face, shifting hands and feet slowly and carefully from one projecting coral point to another, was tedious and painful work. The projecting points of coral were worn smooth by the native feet constantly passing over them; a passing shower had made the coral as slippery as ice, and the occasional pools of water in the central depression of the island had not improved our boots for this kind of work, where to slip meant a fall of some hundreds of feet.

"About halfway down a slight projection afforded a much-needed rest, and we were met here by a group of native women, who were carrying up great bundles of coconuts, firewood, and food from their gardens below. Everything was carried up on the head, and it was wonderful to see the dexterity shown in balancing the load as they climbed up the steep track.

"A reading of the barometer gave the height here as 280 feet, and I am rather inclined to think at some time or other this was the water-

line of the reef, the coral above this line being most distinctly more weathered than that below it. Continuing the descent, the bottom of the cliff was found to be 90 feet above sea-level, and this also seemed to have been a water-level at some time. From the foot of the cliff a gentle slope, covered with cultivation patches and thick scrub, fell away towards the water. A few small huts were seen on the edge of the



scrub, which we were told were used as living-houses by people working in the gardens, or building and repairing canoes on the beach. About 200 yards or so from the foot of the cliff a raised beach, of large water-worn coral boulders and a small quantity of sand, was crossed; it was about 5 feet higher than the land between it and the cliff, and a barometer-reading made the height above sea-level 60 feet.

"The land—upon which were growing some very large trees and thick undergrowth—from the raised beach to sea-level did not appear to be cultivated, and was thickly strewn with broken coral and large

boulders, not so much vegetable mould being present among them as was the case nearer the foot of the cliff. The height of the tops of the trees on the highest part of the island, worked out by sextant angles from Gawa, gave the highest point as 520 feet above sea-level."

Kaileuna and Kirwina in the Trobriands are coral islands. Although both are for the most part low, the latter presents well-marked coral cliffs at its northern extremity. Beyond these to the west stretch a number of reefs and coral islands, the extent of which has not yet been accurately determined. Nada and Egum groups are atolls on which are a number of coral islands. In the centre of Egum atoll is the

IRRIGATION AQUEDUCT, BARTLE BAY PLAIN.

island from which the group takes its name. At the northern extremity of Egum Sir George Ruthven le Hunte describes a rocky prominence "composed of bare rock with its strata lying at a vertical angle . . . and traversed by a broad vein of pink rock." *

No raised coral reefs have as yet been reported on the D'Entrecasteaux archipelago, though these have been noted by Mr. Gibb Maitland in the Louisiades at Misima, Panaet, Wari, and Kimuta (about 10 miles east of Misima). On the mainland, the same authority notes raised reefs at Awaima, Bartle bay, and Cape Vogel; while on the south-eastern coast there is a raised reef on Einauro island, about 2 miles

* Annual Report, 1900–1901, p. 17

from Milport harbour. The distribution of the raised coral reefs just mentioned, and those previously referred to, are indicated in the sketch-map by dark areas or thickened outlines of the islands in which they occur. It will be seen that they indicate that a very large portion of British New Guinea has been uplifted.

The usual height above the present sea-level of the raised reefs in and around the south-eastern extremity of New Guinea varies from a few to 500 feet, but Mr. Gibb Maitland mentions a coralline limestone, called by the natives "korada," which forms a prominent object in the landscape at a height of 2000 feet up the mountain-side above Awaiama. He could detect no fossils in this. As regards the date of the uplift corals collected by Major Daniels from raised reefs at Bartle bay, which he estimated to be between 300 and 400 feet above sea-level, are stated by Dr. Marr to be late Tertiary or recent, as are those collected at Tohunu. The idea of recent movement is supported by the geology of Bartle bay. On page 351 is a rough sketch-map of the small area immediately surrounding the bay studied by Major Daniels, from whose manuscript the following notes are taken almost as they stand.

The country surrounding Bartle bay is, generally speaking, hilly and broken, without any striking preponderant mountains, hills, or valleys. The bay itself is a shallow indentation in the south coast of Goodenough bay, of roughly crescentic shape; the distance from horn to horn of the crescent being about 5 miles, and the general direction of a line joining the two being east and west. At the eastern extremity of the bay a hog-back hill rises abruptly from the sea to an estimated height of some 500 feet, and runs nearly south for 2 miles, then trending westward until, about 3½ miles from the coast in a direct line, it becomes broken, and ends rather suddenly at a point a little east of a north-and-south line drawn through the centre of the bay. Around the south-western foot of the Hogback a stream—the East river—debouches from the mountainous country inland on to the flat we call the Plain. Across this it takes a somewhat sinuous northward course to find the sea a little east of the bay's centre.

The sea-floor along the whole coast of the bay is extremely steep to, with no bottom in 30 fathoms half a cable length off shore. This beach itself is composed of water-worn pebbles. Behind this, except at the bay's extreme western limit, lies a remarkably level plain, which has already been alluded to as the Plain. For the most part the Plain joins the beach at the latter's horizon; but where the Plain's inequalities raise it above beach-level, the junction takes the form of low bluffs whose maximum height is never more than 12 feet. Here and there along the bay's coast, but always at some distance from the mouths of the East and Wamera rivers, a certain amount of coral is growing in the form of very narrow fringe reefs.

The eastern, and to a certain extent the south-eastern, boundary of

the plain is the Hogback, which everywhere rises sharply from nearly level ground. On its extreme north-west the Plain ceases abruptly at the most eastern of a series of flat-topped plateaux, called in this paper the Terraces. These rise one after another, sometimes with slight intervening depressions towards the south-east, till they meet a range of broken hills which we call the Western hills, which have an estimated maximum height of 1000 feet. The Terraces abut on the sea for about a mile, their slopes being so steep as to be nearly true cliffs, faced with a narrow beach. Beyond the Terraces' most western extension, the Western hills occupy the coast-line till the western limit of the bay is reached. The eastern boundary of the Terraces (where they abut on the Plain) is of very irregular outline, and their southern limit does not reach more than 1½ to 2 miles from the coast in a north-and-south line, the western boundary of the Plain being taken up, after the Terraces cease, by a southerly and easterly extension of the Western hills. These hills then push south-east along the Plain's edge till, at a point a little west of the bay's centre and about 3 miles from the coast in a north-and-south line, they swing more to the east, and move in that direction to the south-western end of the Hogback. The Plain, bounded as above described, is roughly triangular in shape, with the curved line of the bay's coast for its base.

Besides the East river already mentioned, a second stream, the Wamera, debouches on to the Plain through the Western hills a little south of the southern limit of the Terraces, and, after skirting their eastern flank for a short distance, pursues a north-easterly course of considerable sinuosity, to find the sea about half a mile east of the most eastern terrace.

The Anglican mission station is located on the high ground in the angle formed by the eastern and coastal boundaries of the most eastern terrace.

The Plain.—The Plain is both remarkably flat and level. The soil, usually very free from gravel and stones, is of considerable depth nearly everywhere; and, under an admirable system of irrigation, yields excellent crops of sugar-cane, taro, etc. Below the soil, judging from such scant sections as the Wamera and East rivers have cut in the course of their passages, lie what appeared to be very definite layers of gravel or of sand, or of both mixed, sprinkled sometimes with rocks and even boulders, and with often a considerable proportion of mud, although there were found no distinct argillaceous strata.

After their debouchment on to the Plain, both the Wamera and East rivers occupy well-defined if shallow flood plains of considerable width.

The Terraces.—These formations, of which no visible counterpart exists along the eastern and southern boundaries of the Plain, rise for the most part very suddenly and steeply from the level ground, and with an even sweep except where the Wamera river or some gully

has cut deeply into their sides. Their tops are remarkably level and even, and though the differences in horizon between the highest and lowest are not great, there is a steady upward progression of elevations from north-east to south-west. Where the Terraces abut on the sea, their slopes are even steeper than on the sides of the Plain, and gullies and slides are more frequent; while on the west they break away sharply and irregularly to a deep gulch, dry most of the year, which separates them on that side from the broken country of the Western hills. For the most part each succeeding terrace rises directly from the next lower in point of horizon; but where the width of the formation is considerably reduced by irregularities of outline, there is sometimes a shallow depression separating terrace from terrace.

The most south-western terrace, the highest in point of elevation, and estimated to reach a height of 150 to 200 feet, abuts, without any intervening depression, on a spur of the Western hills, which here become the western boundary of the Plain.

The Terraces are naturally treeless; the soil is thin and poor, very stony, and even rocky, and increasingly so as the junction with the Western hills is approached. Boulders are present here and there on the surfaces of the different Terraces.

Considerable opportunity is afforded in various places for viewing the internal structure of the Terraces, which would everywhere appear to be the same. The formation is completely stratified from top to bottom, the strata seldom more than 2 feet thick, and often not more than a few inches; the materials varying from stones and even boulders, nearly all much worn and rounded, down to gravel and fine sand, but without anywhere presenting any marked amount of strictly argillaceous matter. The strata are sometimes entirely, or almost entirely, composed of one or another material, but more frequently are much mixed; and none of them containing the coarser materials are sufficiently compacted to be called "stone," though some of the homogeneous strata of the finer materials appear as soft sandstone at all horizons from the top to the bottom of the different Terraces.

The strata of which the Terraces are composed present the greatest disorder in the horizontal sequence of the different materials of which they are constituted, but wherever seen and at whatever horizon, they all dipped with great regularity to the north and north-east, and always at an angle which did not vary much from 30°.

It has already been stated that the Terraces abut on hills, which reach an elevation of about 1000 feet, and which we call the Western hills. As far as our inspection went, no stratified material was found on these hills above the level of the highest terrace, the range being composed of country rock, which Dr. Marr states is obviously volcanic and probably basalt.

The position of the raised coral reefs may now be stated. There is

an ill-defined path leading over the Terraces from the mission station into the Western hills, and on through them to the villages on the coast of Goodenough bay to the westward. Immediately after leaving the level of the last terrace for the first slope of the hills, this path skirts a collection of coral masses. Below these masses, and on the terrace itself, are two or three coral boulders, evidently fallen from above, and below these coral fragments strew the terrace slope for many yards. Even the larger masses of coral are not now *in situ* at the (present) horizon of their original growth; for elsewhere on the Western hills, both east and west of this point, long lines of coral can be seen at higher levels, which are constant enough to give ground for a presumption that the coral so appearing has not been much moved since the general uplift its presence above sea-level establishes. Near the masses of coral just mentioned, but slightly up the hillside and a little south, great solid sections of old reef-face have slid bodily down without breaking or overending. Behind and above these lies the old reef-surface, covered with a thin layer of finely broken country rock so decomposed as to bear the usual scanty herbage. Above this, again, but only after a wide stretch of pure country rock, the old reef-surface begins once more, naked and marvellously like, for all its weathering, the surface of a living fringe reef from which the tide has fallen. Just above this, *i.e.* at an estimated height of 350 to 400 feet above sea-level, the level is reached (approximately) of the highest line of coral seen, and above this nothing but country rock was to be found.

Such is the present condition of the uplifted coral at the only point which press of other work permitted to be closely examined; at a point where—and the locality was chosen partly because this fact could be plainly established with the binoculars from the mission station—it has suffered the greatest displacement from its original position relative to the hillside. But it was impossible at this point (or elsewhere from such observations as could be made with the binoculars) to establish the vertical depth of the original growth of the reef with any accuracy, though it seems certain that this depth could not have been more than 40 or less than 30 feet.

The coral *in situ*, or nearly *in situ*, on the west side of the Plain is limited to the Western hills, lying west of the Wamera, and is not even visibly continuous on them at all points where it might be expected to appear. And although it was most carefully searched for, no trace of coral in any position or condition was found or seen (*a*) on the Western hills lying between the Wamera and the East river, (*b*) on the Terraces (with the exception of the fragments already alluded to), (*c*) on the Plain, or (*d*) in the beds of either the Wamera or the East river at any point of their course which came under our observation.

East of the Plain the coral appears here and there (but not con-

tinuously to the eye) on the Hogback, at what must be very nearly the same horizon occupied by the coral *in situ* on the Western hills.

The foregoing account of the geomorphological features of Bartle bay has been given at some length, since it seems to bear on the age of the present coastal zone, and to suggest that the existence of Bartle bay in anything approaching its present form is a comparatively recent event. Dr. Marr, who has read through Major Daniels' notes on Bartle bay, and examined the photographs with which they are illustrated, suggests that the history of the coastal zone at this point is somewhat as follows: There was first a period of subsidence; when this occurred or how long it lasted is quite uncertain, but if the deposition of the reef rocks now upraised marked the closing stage of this depression, this stage was geologically recent, and probably there was no long period before elevation began. When elevation did take place, the coral reefs which had grown during the period of submersion on the flanks of the mountains were lifted to varying heights in different localities not very far apart. The movement was, in fact, in part differential. Further, it may well have occurred in stages. The evidence in favour of this point of view derived from the coral terraces of the Marshall Bennet group and the signs of surf action high up the cliff at Tokunu seems strengthened by the irregular nature of the stratification (current bedding) of the Bartle bay plain and the occurrence of the Terraces. The latter, Dr. Marr suggests, are the remains of old flood plains.

The fertility of the Bartle bay plain has already been alluded to. Roughly, three-quarters of its area is under cultivation at one time or another, and that portion is carefully irrigated from which a crop is to be taken. The southern portion of the Plain—the apex of the triangle—is irrigated from the East river. The intake of the main canal is about a quarter of a mile in a direct line from the nearest of the gardens, but, by reason of the lay of the land, the canal has to travel a good mile around the spurs of three hills, and across a gully (dry except at the height of the rains) some 70 feet wide by 40 deep, before it reaches the first lateral ditch. For this latter purpose an aqueduct of three hollowed logs is used. These are supported by both banks of the gully and two sets of uprights, each log so placed that it slightly underlaps the next preceding and is enough below it to make the path of the water a series of tiny cascades.

The northern portion of the plain is irrigated from the Wamora river, the intake of the canal being located a little below the point of the river's debouchment on to the plain. The canal in this case follows an uneventful course, without hills to circumvent or gullies to cross. Both the East river and the Wamera carry a considerable volume of water, even at the height of the dry season, while heavy floods are said to be, and on the evidence of erosion would appear to be, frequent in the wet season. The dams, therefore, which, in order to give an artificial

head of water, are built across stream immediately below every intake, must be low enough to permit easy repair, and even easy reconstruction in case they are destroyed outright. All intakes are consequently located where the rivers are shallow, in spite of their greater width, where such is the case. The dams, which are made of water-worn boulders and stones, none larger than can readily be put in place by hand, piled loosely, so that the surplus water may easily escape through their interstices, and are never more than about 3 feet high, though they may run to quite 100 yards in length. When necessary, turf and brushwood are used to render the dams less permeable.

The main canals are simply ditches, seldom more than 5 feet wide, and often less, and a foot or 18 inches deep. We neither saw nor heard of any case in which artificial banks had been made to conduct water across the surface of the ground. The laterals are simply the same thing reduced to scale, and there are nowhere any hatches or flumes of wood, nor any aqueducts (except in the case mentioned above, where the canal from the East river crosses the gully). But the results are sufficiently creditable, if not indeed actually marvellous, when it is considered that they were conceived with no more knowledge of engineering than a practical appreciation of the fact that water runs downhill, planned without the aid of any instruments for ascertaining or correcting levels, and executed with no better tools than the workmen's digging-sticks and hands.*

Before the paper, the PRESIDENT: Dr. Seligmann, whose paper we are to hear and discuss to-night, is not appearing on the platform of the Royal Geographical Society for the first time. I dare say some of you present may remember that five years ago Dr. Haddon, whom I am glad to see here to-night, read a very interesting paper on the Torres Strait, Dr. Haddon having gone out there on behalf of the University of Cambridge. One of the members of Dr. Haddon's expedition was Dr. Seligmann, and those who were present that night may remember that on that occasion he added some interesting remarks to Dr. Haddon's paper. Dr. Seligmann has the advantage, in studying anthropology, of being a member of the medical profession. Since the time of which I have been speaking, he has travelled extensively in British New Guinea, and he will now give us the benefit of his investigations there. He is going to introduce what, I believe, is a novelty here—he is going to illustrate his lecture by means of the biograph, which, I am sure, will interest you. I now call upon Dr. Seligmann to read his paper.

After the paper, Dr. A. C. HADDON: It is with peculiar pleasure that I have followed this expedition of Major Daniels to New Guinea. Dr. Seligmann accompanied, as our President has said, the Cambridge Expedition to New Guinea in 1898-99, and he was one of the keenest and certainly the most versatile of my colleagues. Major Daniels, who had travelled a good deal in America, organized this successful expedition with Dr. Seligmann. They came to Cambridge for some months, and they thoroughly prepared themselves for their work, and the expedition was one of the best equipped that has ever left Europe. The credit of it, I may say, is due, in the first place, to the enthusiasm and the knowledge of Dr.

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* ERRATUM.—Page 283, line 12 from top, for "west" *read* "east."

Seligmann, and secondly, to the enterprise, energy, and liberality of Major Daniels. Dr. Seligmann has not been able this evening to do justice to the scientific work that has been accomplished by the expedition. He merely gave us a sample, as it were, of what the expedition did, and it will take some years before we can learn all that was done. It may seem rather strange to you that he referred so much to the hair of the people, but I would remind you that in New Guinea we have a dark-skinned, woolly-haired, noisy, demonstrative people. Now, the Australians have curly hair; and the Polynesians have a lighter skin and straight or wavy hair. The question is, how did the Australians get where they are? We heard in 1898 that in the Bensbach river in New Guinea there were some people resembling Australians; that looked as though they were relics of the people who had marched across into Australia. It is very satisfactory to know that this expedition went to Bensbach river, but they found that the people whom we heard were like Australians were quite typical Papuans. So in that respect the problem of the peopling of Australia is not nearer solution. Then, again, Dr. Seligmann spoke of certain curly and straight-haired people on the eastern part of New Guinea. That, again, is an extremely interesting problem, but there is very little doubt that these people have, at some time or other, migrated to New Guinea, and thus the straight hair of the Polynesians has unravelled the crinkly hair of the Papuans. Up in the mountains, as you have heard, the natives invariably have a dark skin and woolly hair, so it looks as if New Guinea was originally inhabited by dark woolly-haired people. But along the coast other people have come into New Guinea from the Pacific, and in these spots there is a mixture of Polynesians and Melanesians. Among other problems this expedition studied was totemism, an extremely interesting question which we cannot now discuss. Another point of very great interest which they studied was the decorative art of the different places, and especially of the south-east region and the islands. You saw in the lantern slides some very beautifully carved canoes; Dr. Seligmann has made a special study of these, and for the first time we have learnt what this carving means, for no one previously had studied this problem in the field. The study of decorative art can only be done satisfactorily on the spot; anybody can make guesses in museums, but they are not really worth the paper on which they are printed I may say that in this, as in all other subjects he has treated—hair, skulls, customs, religion—Dr. Seligmann has worked as thoroughly as possible within the time. I would like to say one word about the cinematograph films. Perhaps those accustomed to music-halls have seen films clearer and more brilliant; but it is extremely difficult work, as I know from my own experience, to take cinematograph films in the tropics. I have seen many of these dances, and I need hardly say that it is extremely interesting to me to see them again on the screen, but one does miss the colour, noise, and excitement—they are a very noisy people—and one also misses the indescribable odour of the Papuans.

Mr. Henry Balfour: I esteem it a very great privilege to have been asked to come here to-night and listen to this extremely interesting communication of Dr. Seligmann's. At the same time, I would gladly have been excused the duty you have imposed upon me, and for this reason—I have never been to New Guinea, and therefore can speak with no first-hand knowledge whatever. I always think it is far more interesting to hear those who have been on the spot. But at the same time, although I have never had the privilege of seeing the natives of New Guinea, I am none the less able to appreciate the work that has been done by those who went on such an admirably organized expedition as the one referred to to-night. It has been indeed a great pleasure to me to listen to the lecture and to see the photographic representations, not only of the natives in groups and still, but also of the natives in movement. I cannot but think that the more travellers are

encouraged to use the biograph in depicting scenes of native life, the greater will be the advantage to the study of anthropology. These biograph films undoubtedly record scenes realistically where mere verbal descriptions would fail. The films thrown upon the screen this evening really hardly require any description at all; they are descriptive themselves, and extremely instructive, and I hope that the Royal Geographical Society, amongst other bodies, will encourage in every possible way the utilization of this method by all travellers among savage peoples. Dr. Seligmann, as Dr. Haddon has pointed out, has only touched upon the surface, as it were, of the enormous mass of material which lies at the back of what has been presented to us to-night, and I feel quite sure that we shall all look forward with intense interest to the full publication of the results of this expedition, an expedition which I cannot but think has entirely justified the care and pains and expense which have been lavished upon it. After hearing so much about New Guinea, it may seem almost ungrateful to express the hope that expeditions will still continue to go there—what work has been done has been so admirably done that I think this may appear ungracious; but, at the same time, I look forward to one effect of this admirably equipped expedition, and that is, that it may serve as a precedent to others, or the same again—possibly, that would be better—to go out to New Guinea and conduct further researches yet. For this enormous island is one of the most interesting, ethnologically, and there is still a huge amount of work to be done there. A region to which Dr. Seligmann did just refer, the region along the borderland between Dutch and British territory in New Guinea is one that must be of intense interest ethnologically, and the interior, with the exception of a few regions, is as yet virtually unknown. It has been extremely interesting to hear what Dr. Seligmann had to say about those interior natives with whom he came into touch. That is one of the important results of this expedition. There are many questions that require elucidating, such as the routes by which the culture of one region has been transferred, partially at any rate, to another region. It would be interesting to know, for instance, by what route and by what methods objects that are clearly to be associated with the Papuan gulf have come to be transferred to such a distant region as the Bensbach river, in the north-east extremity of British New Guinea. There are problems such as these which await solution, and to which the attention of explorers might be drawn. I think that one of the most interesting discoveries has been the finding of the site of manufacture of the stone adzes which have become so widely spread in their finished form. This is a great point to have made out, and one upon which one would gladly have heard Dr. Seligmann expand more fully. Not only is it interesting in its ethnological aspect, but it also has its archæological interest, for, if we are to explain thoroughly the processes that went on in prehistoric times, in the Stone Age of early date, we are obliged to a great extent to look to the Stone Age of the modern savage for explanation, because there is a chance of seeing the actual processes at work, instead of having to fill up by guesswork, as it were, the lacunæ which must exist in the archæological records. In this way, the bringing together of the ethnological and archæological material cannot but be to the advantage of both systems of study. I should not be justified, Mr. President, in detaining you at this somewhat late hour with further remarks, which, as I pointed out, must necessarily be based upon second-hand knowledge; but I gladly take this opportunity of adding my thanks to Dr. Seligmann for his interesting communication. I think, in conclusion, that it is only just to Major Daniells that some reference should be made to the generosity with which he has presented the specimens forming the valuable collection brought back by the expedition to some of the principal museums of this country.

Dr. J. E. MARR: I feel I have no right to address this meeting after Dr. Seligmann's opening remarks. He said the expedition was essentially ethnological. Our work is essentially geological, therefore I will not detain you long. I should like to bear tribute, however, to the very careful way in which Major Daniels and his colleagues prepared for this expedition, as well as for the manner in which they carried it out. And although geology was a by-product of their work, Major Daniels and his colleagues came up to Cambridge and pursued for some time the study of geology. I should like all explorers, if possible, to do this. It is, alas! too often the custom of explorers not to make this preparation, but merely to press their specimens upon us and expect us to do the rest. Now, Dr. Seligmann made a remark about the apparent recent elevation of the country, and stated that it was perhaps not quite what earlier explorers had concluded. As a matter of fact, Mr. Gibb Maitland, the Government geologist of Queensland, wrote a report some years ago based upon incomplete information, and he has quite recently sent a paper which I have not yet seen, containing the result of the further examination of specimens. I should like to say something about the stone implements. It is very extraordinary the way in which the natives have selected the various stones that were available for particular purposes; they have got the very stone required as far as they could for each particular purpose, one for making adzes, another for making clubs with a perforation in the centre, another again for hammer-stones, and another for grinding-stones. They must have made implements for a very long time before they found the uses of all these stones for different purposes. However, I must not enter at this late hour into the geology of these implements, and I will conclude by saying that we at Cambridge, myself and my colleagues, have only just begun to touch the specimens, but we shall be glad to do all we can to work out the geological materials brought back by this very successful expedition.

Mr. RAY: At this late stage of the evening I do not intend to offer you any very lengthy remarks. I should like to add my tribute to Dr. Seligmann for the extremely interesting set of views which he has shown us this evening, and for the extremely lucid way in which he has explained them. It is one evidence of the care which has been taken by the expedition to gain knowledge upon these points; one evidence of that is shown by the portions of New Guinea which have been illustrated to-night. We first had the western portion by the Bensbach river. The question arises as to the New Guinea people, how they came to the Torres strait, and through that to Australia. I was struck, in that first picture, by the likeness of the Torres strait islanders with New Guinea. We also find connection between their language and the people of the shore. But those languages which are like those in New Guinea are not like those of Australia, so that they bear out the non-connection between New Guinea and Australia. Then later Dr. Seligmann showed us some pictures of the mountain people further up by the St. Joseph river, and some of the people further inland, and he told us that these Mekea people were between the mountain people and the coast people; that also is born out by their language. The Mekeo is one of the strangest in that part of New Guinea; it is similar to Motu, but it contains a great deal of some strange element which has not yet been determined. Then further on Dr. Seligmann took us to the eastern end of the archipelago, and there he showed us that the people have traded from time immemorial westward along the coast, and there also we find the language bears out the very same statement. The languages from the Woodlarks right away along the coast, along in the path of the stone implements, the language is all practically connected, and there the expedition has done good work by showing that connection, and also showing that those languages extend far down to

the south-east right away into the Solomon islands, and further still into the New Hebrides. This shows how carefully the expedition touched upon what may be regarded as the three principal points in New Guinea. There is another point on the north coast which should have been touched, but I do not think the expedition got so far. But, at any rate, Dr. Seligmann has shown us to-night what there is to be done in New Guinea. There is a great deal to be done; there are some very interesting problems to be worked out, and I hope before long we shall see some other expedition going there to follow up the good work and extend our knowledge of that part. I thank Dr. Seligmann for his interesting paper.

The PRESIDENT: I do not know whether there is any one else present who knows anything of New Guinea; if not, I will ask you to join in a vote of thanks to Dr. Seligmann for his interesting paper.

Dr. SELIGMANN: I am sure it is very gratifying to hear all these pretty things said, and to receive your very hearty vote of thanks, for which I thank you very much, both on my colleagues' and my own behalf.

THE GREAT TARAWERA VOLCANIC RIFT, NEW ZEALAND.

By JAMES MACKINTOSH BELL, Director New Zealand Geological Survey.

IT is not yet twenty years since there took place the great eruption of Mount Tarawera, New Zealand, on June 10, 1886; but already great changes have taken place in the configuration of the country and in the display of hydrothermal phenomena, not only in the volcano itself, but along the great rift formed at the same time.

Mount Tarawera lies near the centre of the Taupo volcanic zone, and about 135 miles south-east of the city of Auckland. The Taupo volcanic zone, so named by the Baron von Hochstetter, is one of the most remarkable geological features of New Zealand, and extends from the south-west of the great volcanic cones of Ruapehu, Tongariro, and Ngauruhoe, to White island, on the Bay of Plenty—a distance of nearly 160 miles. The width of the volcanic zone, according to Prof. A. P. W. Thomas, of Auckland, is some 25 miles.* The area enclosed within these dimensions contains practically all the thermal springs, geysers, fumaroles, and expiring volcanoes for which New Zealand is justly famed.

Though the whole Taupo volcanic zone was more or less affected by the Tarawera eruption, only a comparatively small portion of it was very seriously influenced. This very pronounced influence was felt in the immediate neighbourhood of the great rift, or more correctly line of craters, which stretches from Mount Wahanga, the most north-easterly part of the Tarawera range, to a point about 600 yards north-north-west of Lake Okaro. The length of this huge fissure is about 9 miles, and its direction N. 68° E., while the trend of the Taupo zone in general is 20° more northerly.

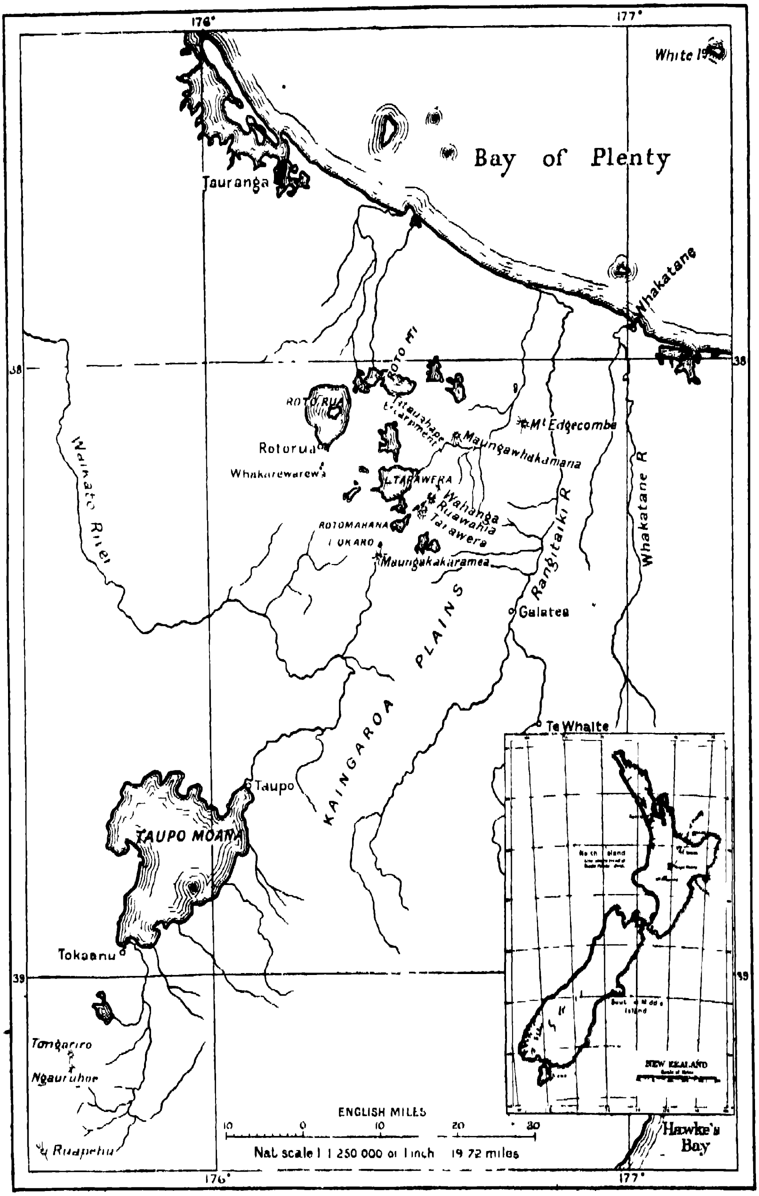
* See 'Report on Eruption of Tarawera and Roromahana, New Zealand,' p. 5, by Prof. A. P. W. Thomas.

By the eruption of Mount Tarawera, 130 people were killed, the world-famed pink and white terraces were destroyed, and the country for an area of over 6000 square miles devastated.

The Tarawera range is a very prominent feature in the topography of the north island of New Zealand, and above the low country which surrounds it it stands out with very decided relief. The range comprises three peaks: Mount Wahanga, quite distinct, and Mount

WAIMANGU GEYSER IN ERUPTION.

Ruawahia and Mount Tarawera, which are practically one peak. Prior to the eruption of 1886, Ruawahia, the highest peak, had an elevation of 3606 feet, to-day it is 3770 feet. The great rift cuts the summit of the Tarawera range, and appears on its south-western slope. West-south-westward from the Tarawera range, and in the same direction as its main axis, lies Lake Rotomahana. In continuation along the same line are the deep holes forming the Black crater, the Fourth crater, the



TAUPO VOLCANIC ZONE

Waimangu crater, the Inferno crater, the Echo lake crater, and the Southern crater. These will be described later.

Lying north-west of the Tarawera range, and just at its base, is the lake of the same name, with a length from north to south of about 9 miles, and a width in the opposite direction of some 6½ miles. The lake is surrounded by broken volcanic hills which rise to a height of 400 or 500 feet. North-westward and northward from Lake Tarawera lies a rugged volcanic country, dotted with numerous lakes, the largest being Lake Rotorua. These lakes appear to fill depressions formed by the

HIGHEST KNOWN ERUPTION OF WAIMANGU

down faulting of limited areas in a lava plateau, which formerly existed, and is now represented by the flat volcanic hills which border the lakes or their basins. North-eastward from Mount Tarawera extends a series of low hills, clothed in a monotonous cover of volcanic ash, broken only by the tall leafless stumps of trees, which remain as a ghastly tombstone of the dreadful eruption. On this landscape, Mount Maungawhakamana and Mount Edgecumbe, two elevated volcanic peaks, stand out in definite relief. Far to the north-eastward lies the Bay of Plenty, surrounded by a narrow coastal rim, the beginning of a coastal plain. East and south-east of the Tarawera range lies the dreary,

slightly rolling expanse of the Kaingaroa plains, devoid of trees, and terminated by the Whakatane range, which rises with the singular abruptness of block mountains just east of the Rangitaiki river. Westward, the Kaingaroa plains lose their level character, become much more broken, and are surmounted by several volcanic peaks, the most prominent of which is Mount Kakaramea. The whole country immediately along the great rift is quite devoid of vegetation save for the native grass toi-toi and tutu, which have been able to find sufficient material for sustenance in the new volcanic tufa ejected at the last eruption.

All rocks of earlier age than the eruption of 1886 are hidden beneath

FRYING-PAN FLAT AND ECHO LAKE CRATER ARE THE SAME.

a thick covering of cinders, scoria, and ashes, ejected at the time of the eruption. This deposit follows, however, the pre-existing contours, and on the more angular hills has merely rounded their outlines. The deposit of tufa, of course, is exceedingly soft, and though it has become somewhat packed within the nineteen years which have intervened since the eruption, it still shows practically no consolidation, and has become deeply sculptured by innumerable streamlets and rills, which intersect it in all directions. Viewed from the top of Mount Tarawera, the surrounding country resembles an immense ploughed field with furrows of gigantic size.

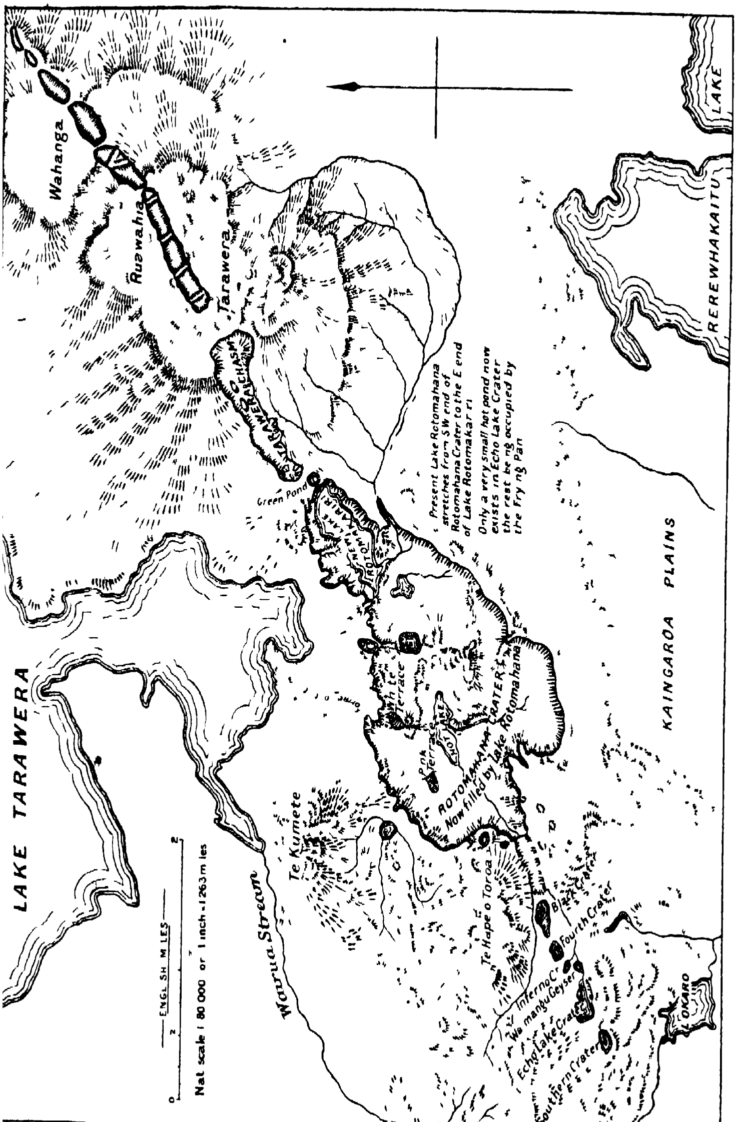
The geology of the Tarawera area is simple. The rocks are entirely

volcanic, though the various species are of somewhat different origin. Apparently the oldest rocks consist of trachytic and rhyolitic lavas of slightly different petrographic character. Overlying these, or possibly in part contemporaneous with them, are thick beds of acidic tufas and agglomerates. These fragmental rocks are of the same chemical composition as the lavas, and probably represent the comminution by the force of explosion of the latter. Above these acidic rocks are the deposits of the recent eruption, which are much more basic in character.* Lava rose to the surface only on Tarawera mountain itself, and even then it flowed only a very short distance from the lip of the crater. It has been identified as an augite andesite, almost basaltic in character. The volcanic dust ejected at the same time vastly exceeded the lava, since the eruption was intensely explosive in character, due to the enormous quantity of steam. The ejecta are naturally thickest near the fissure, being on Tarawera mountain upwards of 20 feet, and narrowing laterally. In general, its thickness is greater towards the east than to the west.

The great fissure on the summit of the Tarawera range, though practically continuous, is divided by low partitions into several somewhat distinct craters. On the summit of the range, the craters are in general funnel-shaped, with the lower part of the walls—consisting of lava—steep and precipitous, but tremendously shattered. The upper part of the walls, being composed of soft tufa, are of more gradual inclination. Originally, the deepest crater was upwards of 800 feet in depth, now it is scarcely 500 feet, the bottom being filled with the *debris* which has fallen in from the sides. The colouring in the craters is magnificent. The lavas, encrusted with sulphur and stained with iron rust, are fresh shades of yellow and orange. The acidic tufas are tinted orange or black, while the recent tufas show interbanded layers of a brilliant hematite red and deep rich purple. Steam, slightly charged with hydrogen sulphide and other gases, issues at various points within all the craters, though seldom in great quantity. However, the actual amount varies with atmospheric conditions. On the south-west side of the hill a long narrow rift extends to the base of the hill, on the edge of Lake Rotomahana. The slopes of the Tarawera range extending towards the north-eastward and north-westward are of beautifully rounded outline, and, completely clothed in a thick covering of blackish and reddish cinders, are quite devoid of any signs of vegetation. For several years after the eruption of 1886 billets of wood could be ignited by inserting into the crevices along the slopes of the range, but now a temperature above that of surface is observable only at the points where fumaroles issue.

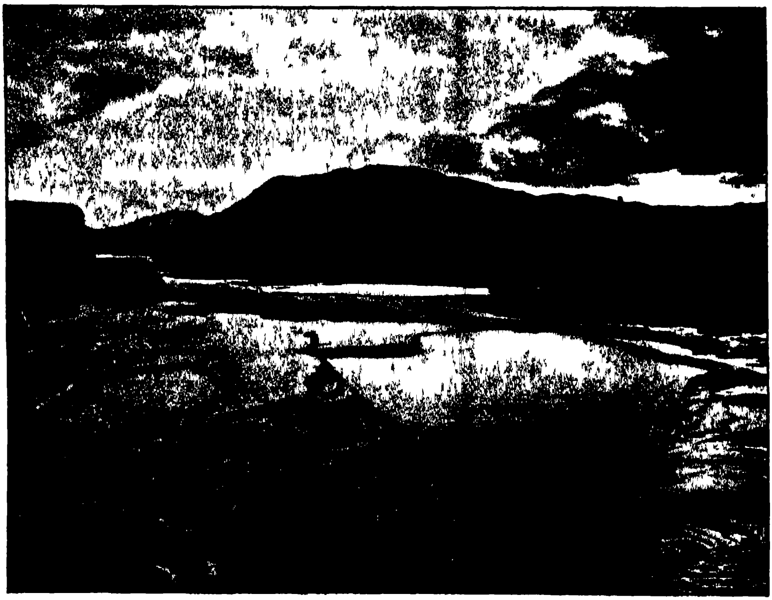
The most north-eastern crater of the great rift lies on the south-

* See Report by Prof. A. P. W. Thomas.



TOPOGRAPHY OF THE TARAWERA VOLCANIC RIFT
SOON AFTER THE ERUPTION OF 1886.

western slope of Mount Wahanga. Its sides have collapsed to a greater extent than have those of the other craters on the summit of the Tarawera range. The colour effects of this crater are especially fine, the contrast between the light yellowish-white tufa and the bright carmine and purple ash overlying being exquisitely marked. From the summit of Mount Ruawahia a splendid view of the surrounding country is obtainable. Far to the southward are visible the lofty snow-clad peaks of Mount Tongariro, Ruapehu, and Ngauruhoe, the latter generally capped by a cloud of steam. Somewhat nearer is the broad basin of Lake Taupo, surrounded by hills of irregular shape, the most



WHITE TERRACES (NOW DESTROYED)

pronounced being the cone-shaped peak of Mount Tauhera, located on its northern edge. The wide valley of the Waikato is traceable for miles, bordered by flat-topped hills to the westward. Eastward may be seen the desolate waste of the Kaingaroa plains, bordered by low wooded hills. Northward one looks upon a beautiful lake-dotted country, with occasional patches of timber; while away to the north-eastward can be seen the broad expanse of Bay of Plenty, dotted with numerous volcanic islands, among which is White island, bathed in steam.

Lake Rotomahana, which lies just to the south-west of the Tarawera range, is separated from the rift on the slope of the range by a deep

pond, with steep walls, which fills a small crater. Lake Rotomahana is a sheet of dirty muddy green water, some 3½ miles long by less than 2 miles in the opposite direction, and with a maximum depth of 427 feet. It occupies the site of an immense crater, which was evidently, from all accounts, the most active point of the Tarawera eruption. Immediately after the great outburst there was comparatively little water, distributed in a number of small ponds, in the huge hole, but with no outlet the water gradually rose, and to-day is still rising, though much of the water entering the lake must find some subterranean outlet.

WAIMANGU BASIN (DORMANT)

The boundaries of Lake Rotomahana, as it now exists, practically correspond with the walls of the crater. The world-renowned pink and white terraces, and many other remarkable hydrothermal phenomena, were formerly to be seen, surrounded by a scant but beautiful shrubbery, where now is visible only the waters of Lake Rotomahana, bordered by dreary hills of volcanic ash and scoria, practically devoid of vegetation. The low hills, well sculptured into innumerable shallow sharp ridges and valleys, descend in places gradually to the lake-shore, or again rise abruptly in precipitous cliffs from the water's edge. Thermal action is at present limited to the western end of the lake, where, however, there is abundant evidence of the proximity of a heated interior. At this

point the stratified tufa beds are much faulted and cracked. From the cracks great columns of steam continually ascend, and in places belch forth under considerable pressure. Springs of boiling water issue at numerous points, and some of these are depositing thin crusts of whitish silica. Some of the steam-jets are faintly solfataric in character. During the winter of 1905, a portion of the low cliff close to the shore in this part of the lake collapsed, and soon after a geyser appeared where the steaming cliff had been. It is said to have played to a height of 150 feet, though in general the height was much lower, and after the first four days the jet of water never ascended higher than 12 feet. After playing almost constantly for about two weeks, the geyser ceased altogether.

A warm stream, the outlet from Waimangu crater, enters the south-western end of Lake Rotomahana. It flows in a low flat, which has been eroded by its own action, and that of a cold-water stream joining it, in the soft tufa beds. At about half a mile from the lake the valley of the warm-water and of the cold-water stream divides, and each narrows considerably, being hemmed in on either side by almost vertical walls.

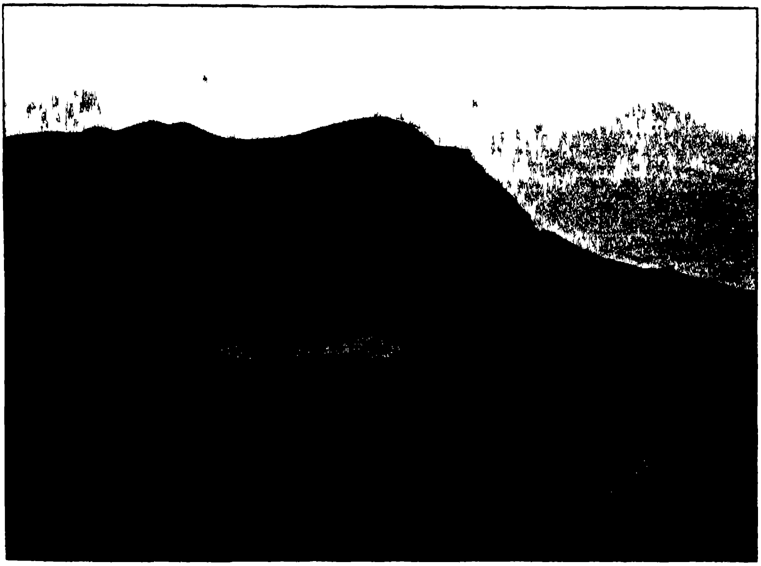
The Black crater, which lies about three-quarters of a mile west-south-west from Lake Rotomahana, is roughly the form of a dumbbell, and is made up of two deep funnel-shaped holes, divided by a low partition. Though very active for some time after the great eruption, thermal action is now evident only in a few fumaroles, which deposit thin coatings of sulphur. In rainy weather, however, there is considerable steam to be observed within the crater.

Close to the Black crater is the fourth crater—a deep, narrow, almost circular hole with steep trachyte walls. Very little steam issues from its sides. Just south-west of the Fourth crater are the great deep craters of the Inferno and Waimangu; both flow continually, the streams running in steaming cascades and uniting about 50 yards below each outlet to form the hot stream which enters the western end of Lake Rotomahana. Just below the junction a small geyser plays almost unceasingly in a column 5 or 6 feet high, forming a low angle with the horizon. This geyser has been in action only since the cessation of the great Waimangu geyser.

The Inferno is a deep round pool, bordered by steep walls over 300 feet high on its northern side, but much lower towards the south at the outlet. The temperature of the pool is about 180° Fahr., and its surface is rather less than 2 acres in extent. Clouds of steam charged with hydrogen sulphide are continually belched forth from the dark dismal pool, and a view of its surface, almost continually on the boil, is seldom obtained. Frequently it booms ominously, but only on rare occasions has it been known to exhibit geyser action. The most notable time was about two years ago, when it is said to have suddenly

burst into action, and a column of water ascended vertically about 150 feet from a point near the centre of the pool.

The geyser of Waimangu has for years been the greatest wonder of the thermal wonderland. The geyser was discovered in January, 1900. It is not supposed to have been active much before that date, as at the time of discovery ferns were observed growing close to the edge of the pool. While playing, outbursts occurred nearly every day, and sometimes more frequently. The shots were of gigantic proportions, mud, sand, and immense boulders being propelled in huge columns of dirty



MOUNT WAHANGA, SHOWING THE GREAT RIFT

black water vertically into the air. At some hundreds of feet above the water the column broke into a great cauliflower-shaped mass, surrounded by clouds of steam, which showered the boulders, mud, and sand back into the pool, and even high up on the walls which surrounded it. The highest shot is supposed to have ascended to a height of 1500 feet above the water, and to have carried a volume of 800 tons. Accurate data relating to these dimensions are difficult to obtain. The outbursts of this wonderful phenomenon were awful in the extreme, the magnificent proportions appearing to even dwarf the heights of the hills around. In July, 1904, the great geyser suddenly ceased, and for seven weeks and five days remained dormant; then it again burst into action, and until the 1st of November of the

same year almost daily outbursts occurred. Then it stopped, and up to the present there has been no further explosive activity. The whole explosion usually lasted about forty seconds, the initial ascent being much more rapid than the descent. The temperature of Waimangu is about 130° Fahr. Its surface is quite placid, and steam only occasionally rises. A blackish deposit, consisting chiefly of free sulphur and of ferruginous sulphides, is formed on the edge of the pool. While in action the pool of Waimangu was 130 feet long by 80 feet wide; but since the geyser has ceased playing, these dimensions, owing to the insilting by the entering streams, have considerably lessened. The outlet from Waimangu is on its eastern side, while on the south-western side a chute of warm water falls over a low cliff from the Echo Lake crater.

About ten years ago Echo Lake crater contained a lake almost a quarter of a mile long, and of about the same width; it has now diminished to a small pond a few yards across, lying at the base of a cliff of variegated tüfa (known as Gibraltar rock) from which numerous steam-jets issue. The temperature of the water is just under the boiling-point. An immense boiling spring enters the pond just at the base of Gibraltar rock, but its temperature is decreased by the entrance of a small cool-watered stream. About halfway between Echo lake and the edge of Waimangu is the Devil's blow-hole, an immense jet of steam which issues under enormous pressure. According to the intelligent Government guide at Waimangu, Mr. H. M. MacPherson, the force of this blow-hole has tremendously increased since the cessation of Waimangu. However, he does not think that the increase is sufficient to account for all the steam which formerly found exit in the gigantic outbursts from Waimangu. My distinguished predecessor, Sir James Hector, who has for years watched the movements of the New Zealand geysers, considers that it has ceased on account of the increase in the diameter of the orifice through which the boiling water, supercharged with steam, issues from its subterranean reservoir.

South-west from the dwindled Echo lake, and forming the floor of the remainder of the crater, is the curious flat known as the Frying-pan. Its surface consists of tufa, hardened mainly by silica, but in part by incrustations of alum. Through this crust spout innumerable small jets of boiling water, which bathe the strange plain in clouds of steam. A walk over the Frying-pan is most uncanny. The plateau is at a temperature but little below the boiling-point, and, though not actually very thin, the numerous apertures through it give the effect of walking upon tissue paper.

The Southern crater, which is the most south-westerly of all the craters along the line of the great rift, lies about 200 yards south-west of the Frying-pan. Like most of the craters, it is bordered by precipitous walls. It is filled by a pond of greenish water, 50 or 60 yards across by 100 yards in length, and 60 or 80 feet deep. Some years

ago the crater was quite dry. Unlike the other craters, it shows no signs of thermal activity. The immediate effect of the Tarawera eruption upon the other thermal centres of the Taupo volcanic zone was often very pronounced. The springs about Rotorua gave striking evidence of increased flow. At Whakarewarewa new geysers burst into action, and at Waiotapu new fumaroles and other thermal phenomena appeared. There seems to have been little or no influence upon the thermal centres around Lake Taupo and along the Waikato valley.

BRAIN POT AND POHUTU GEYSER, ROTORUA.

The effect of the immense earthquakes which accompanied the eruption are very apparent; several wide parallel cracks, subsequently enlarged by atmospheric agencies, traverse the level plain known as Earthquake flat, on the road between Waimangu and Whakarewarewa, and another of considerable proportion is observable on the road between Rotorua and Lake Tarawera. Some of the cracks in Earthquake flat show a very decided vertical displacement of strata.

The effect of the Tarawera eruption on the drainage channels of the district was decided. Streams were temporarily dammed, and former outlets of lakes were obliterated. The influence upon the level of Lake

Tarawera is especially interesting. During the eruption the bed of Tarawera creek, which drains the lake of the same name, filled up, and the lake immediately started to rise. For years some of the water found exit through cracks in the tufa which filled the creek bed, appearing at the base of the Tatauahape escarpment, some 2 or 3 miles below the lake. Just after the eruption the lake is said to have risen 28 feet; from that time until November, 1904, it ascended 42 feet in all. Then the water rose over the dam of tufa which prevented its exit along the old channel, breaking much of it away. The water in the lake almost immediately dropped over 11 feet, and, flowing along its old channel, fell over the Tatauahape escarpment, forming the falls of the same name. Low cliffs, marking the former level of the lake, testify to the changes which its surface has undergone.

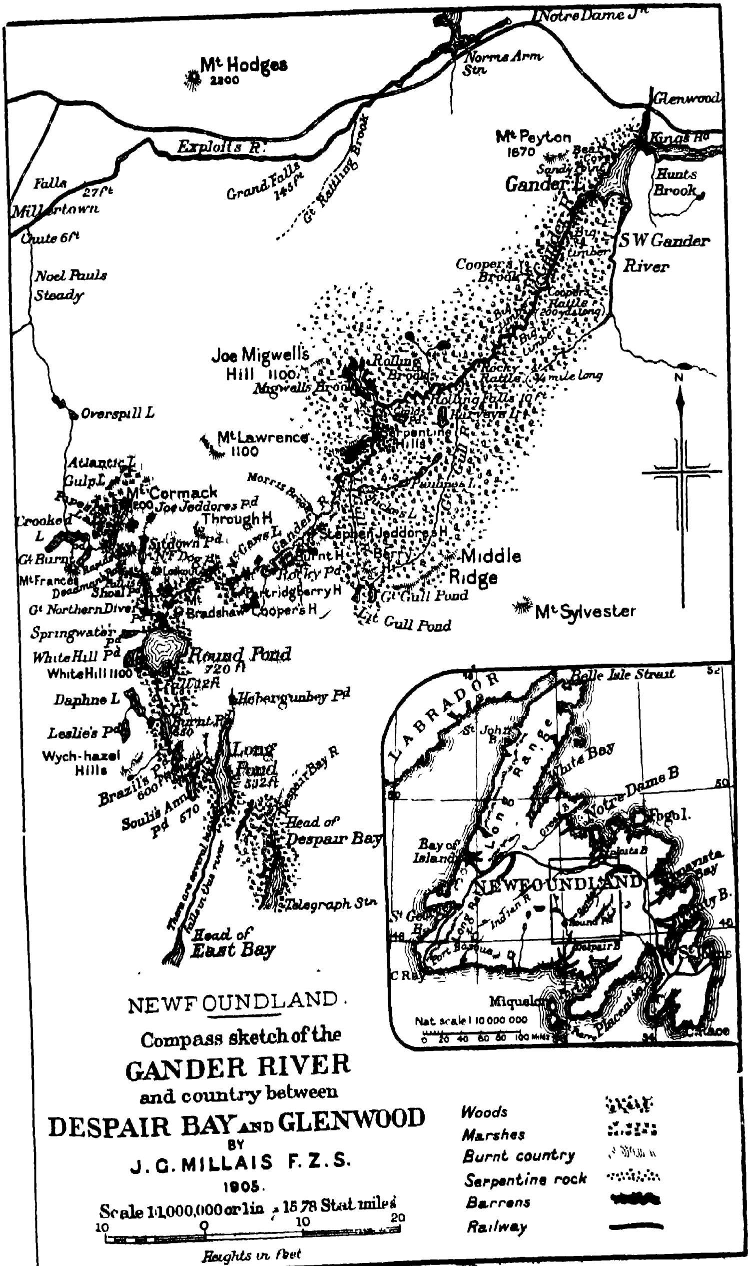
The Taupo volcanic zone, with its abundant evidence of expiring vulcanism in the form of geysers, fumaroles, and boiling springs, forms one of the most fascinating areas for scientific investigation, in a country so rich in natural phenomena as the islands of New Zealand.

CENTRAL NEWFOUNDLAND AND THE SOURCE OF THE GANDER RIVER.

By J. G. MILLAIS, F.Z.S.

It is somewhat surprising that the interior of Newfoundland should be less known than parts of Central Africa or the Arctic Regions, and still more so when we consider that the island has been occupied by Englishmen since the days of Henry VII., and is our oldest colonial possession. But the reason for this lack of enterprise is not far to seek. A colony must, in the first place, be in possession of funds to send out properly equipped geographical expeditions to ascertain its natural features, and in this respect Newfoundland has been somewhat handicapped, but not to such an extent that there is any excuse for the lack of ambition to know their own country on the part of the various Newfoundland governments. Parsimony and the conditions of trade have ever been the island's watchword, so practically nothing was done to ascertain a knowledge of the interior or its natural resources until William Cormack made his memorable journey in 1822. In spite of considerable opposition, this brave pioneer set forth on foot, accompanied by one Indian, Sylvester by name, and crossed the island from Trinity bay to St. George's bay, taking just over two months in which to complete the arduous journey. The introduction to the short account of his travels * is both instructive and sarcastic, showing as it does the attitude of the authorities towards his undertaking.

* 'Narrative of a Journey across the Island of Newfoundland.' By W. E. Cormack. The only one ever performed by a European. St. John's: 1873.



NEWFOUNDLAND
Compass sketch of the
GANDER RIVER
and country between
DESPAIR BAY AND GLENWOOD
BY
J. G. MILLAIS F. Z. S.
1905.
Scale 1:1,000,000 or 1 in = 15.78 Stat miles
Heights in feet
Woods
Marshes
Burnt country
Serpentine rock
Barrens
Railway
Notre Dame Jn
Norris Arm Stn
Mt Hodges 2200
Glenwood
Kings Hd
Exploits R.
Mt Peyton 1670
Gander L.
Hunts Brook
Grand Falls 145 ft
Gt Rattling Brook
Falls 27 ft
Millertown
Chute 6 ft
Noel Pauls Steady
S W Gander River
Coopers Brook
Joe Migwell's Hill 1100
Migwalls Brook
Rolling Brook
Rocky Rattle
Rolling Falls 10 ft
Harveys H
Overspill L
Mt Lawrence 1100
Atlantic L
Mt Cormack
Joe Jeddores Pd
Through H
Crooked L
Middle Ridge
Gt Gull Pond
Lit Gull Pond
Mt Sylvester
Mt Frances
Gt Northern Diver Pd
Springwater Pd
White Hill Pd
White Hill 1100
Round Pond
720 ft
Daphne L
Hebergunbey Pd
Leslie's Pd
Wych-hazel Hills
Brazil's Pd
Long Pond
532 ft
Souli's Arm Pd 670
Despair Bay R
Head of Despair Bay
Telegraph Stn
Head of East Bay
N
LABRADOR
Belle Isle Strait
White Bay
Notre Dame B
Bay of Islands
NEWFOUNDLAND
Indian R
St Georges B
C Ray
Miquelon
Placentia
C Race
Nat scale 1 10 000 000

"Early in the spring of 1822, being in Newfoundland, a far-famed country in which I felt a most lively interest, and free from professional engagement, I determined upon exploring the interior of the island, a region almost totally unknown, and concerning which and its inhabitants, the Red Indians, who were supposed to occupy the whole of it, the most besotted conjectures were entertained, particularly by the chief delegated public authorities, to which quarter one was inclined to look for some proofs of a feeling of interest for the condition of the country, *through the means of which they obtained their bread.*"

Cormack, although not a geographer, marked several important points, such as Mount Sylvester, which he named after his faithful Indian, the two Maelpegs, and George IV. lake, whilst Cormack lake and Mount Cormack, the central spot of the interior, were named after him. About the year 1868 Alexander Murray and William Howley were granted small funds to survey the interior. Sometimes they were not even allowed to choose their followers, a most important point in every expedition. Yet the amount of work done by these able geographers will bear lasting tribute to their energy and determination. The main waterways leading into the interior, such as Grand lake, Red Indian lake, the Terra Nova, Long Harbour river, the East bay, and the La Poile river were all surveyed and charted, principally by Mr. Howley, whose great work has never received proper recognition, although he has spent his best years on the subject, and risked his life many times. The difficulties of travel in Newfoundland are such that none but the most experienced voyagers can surmount them, and Mr. Howley has always been accompanied by Indians, except on occasions when the various Governments have forced their useless partisans in his service.

Naturally it was quite impossible for even such a man as Howley to be invariably successful in his work, and much of it had been done from hearsay or conjecture and by adhering closely to the waterways themselves. Consequently matters of importance, such as the natural features in shape of mountains and lakes in the immediate neighbourhood of the waterways, were often incorrectly charted or left out altogether. On the whole, however, Mr. Howley's work is most reliable.

It was to fill up some of the gaps in the unwritten page, and to discover, if possible, the actual source of the Gander, the second largest river in Newfoundland, that I set out on my third expedition to the country in 1905. After a month spent in whale hunting, and in examining whales for a work on British mammals on which I am engaged, I was met at Placentia on September 1 by my friend John McGaw. McGaw had previously studied geography and surveying, and had received considerable help in map-making from the Geographical Society, who seem always ready to assist their pupils, an unselfish

duty which other scientific bodies might follow with advantage. I found him an admirable companion, a good shot, and an industrious worker at whatever subject he turned his hand. It made our duties light and pleasant, for whilst he surveyed one line of country I could attend to another, and in the evening we joined forces and made our map together.

Dense fog enclosed the whole of the south coast; but when we arrived, after two days in a steamer and one in a schooner, at our starting-place on the banks of a small river at the head of Despair bay, the sun shone out brilliantly, and for a month and more we enjoyed the most delightful weather, the average temperature being very much the same as Scotland, although somewhat colder at night. Starting on September 3, and accompanied by six packers, exclusive of our own four helpers, we journeyed across a small range of hills to the large lake known as Long pond, a distance of 6 miles from the head of Despair bay. Here the packers left us to our own devices, and we travelled across Long pond 2 miles, and up the East Bay river to Soul's Ann pond, another large lake, where, bad weather coming on, we were detained for a day and a half.

To the east of Souli's Ann pond the whole country is sparsely wooded, except round the lakes and rivers, where the timber is more dense. The trees consist of white pine, red spruce, black spruce, larch, white and black birch, poplars (haps), maple, mountain ash (dogwood), choke cherry, small wild cherry, hazel, and alder.

The "open ground" or "country" is covered with "Indian tea" bush, goudie (*Kalmia glauca*), a lovely flowering shrub, and dwarf spruce, creeping birch, and juniper. On the ground are various mosses, notably the common reindeer moss, and a large number of berries, cloudberry, cranberry, partridge-berry, bearberry (*Empetum nigrum*), a favourite food of the Canada goose, whilst blueberries grow in vast quantities wherever the forest has been recently burnt.

Immediately round Souli's Ann pond the whole country is "burnt," and the melancholy area of destruction extends as far as the eye can reach to the east and west. This great gaunt sea of grey poles is now interspersed with young and growing timber of various kinds, some of it 10 and 15 feet high, and affords good cover for game, and in the course of twenty years the country will again recover itself to a certain extent. It takes about eighty years for a forest to grow.

The fire which created this terrible destruction began in the autumn of 1893, immediately to the west of Brazil's pond. Its origin is unknown, but in a dry season it made rapid headway and burnt out the whole of Souli's Ann, Brazil, Little Burnt, and the eastern side of Round pond. The Indians say that it smouldered all the winter and then started again in the spring, and, favoured by a south-west wind, burnt as far north as it could go to Crooked lake and Pipestone. It

also worked down the Gander a short distance, and afterwards turned north-east along Great Rattling brook, and reached the railway at Badger brook, where it stopped. The western side of Round pond was missed by the fire, as well as a 5-mile strip of white pine near Great Rattling brook, a section reported to be the finest timber in Newfoundland. On September 7, in beautiful weather, we paddled up Brazil's pond, and at noon entered the short section of the East bay that connects this lake with Little Burnt pond, which is 650 feet above sea-level. Here we found walking and frequent portages necessary, owing to the difficult and rocky character of the stream. It was in such places that our Indian guide, Joe Jeddore, exhibited his great skill as a canoeman. Standing up in the light 16-foot basswood boat, he poled through rapids and past rocks where the less accomplished white men had to toil in the water emersed to their waists. The slippery character of the bed, too, created occasional disaster, and more than once we saw our faithful but somewhat clumsy followers disappear in the shallow torrent. But all discomfort was undergone by the Newfoundlanders with that cheerful stoicism which marks them as the hardy and good-natured race which they undoubtedly are.

At the north-west corner of Little Burnt pond, and looking from the ridge of the Wych-hazel hills, three lakes can be seen. One of these, Lake Daphne,* is about 3 miles long, and is a considerable sheet of water. In existing maps, Little Burnt pond seems to extend almost to the entrance of the large lake known as Round pond, but this we found to be a mistake, for there is a connecting portion of the East Bay river, nearly 3 miles in length, with a fall of 12 feet half a mile from Round pond.

In darkness we reached Round pond, the largest sheet of water in Central Newfoundland, and camped there for the night. Looking across the glassy waters away to the north-east, we could see the peak of Mount Bradshaw (called after one of Alex. Murray's able assistants) towering up above the green timber, and the only landmark visible. Round pond is another somewhat dangerous sheet of water to circumvent in small canoes, so we had to be careful next morning, as a good breeze was blowing astern as we headed northwards. At nine o'clock the Indian spied a large caribou stag about a mile ahead, and after a long and hard paddle I headed the beast and shot him at 150 yards. Meat being an essential compensation for hard work in the wilds, we were all delighted at this piece of good fortune, and continued our journey in high spirits to the north end of the lake, where a brook comes in from the north-west from a small pond called by the Indians Godoleick, or Spring-water pond. Here were noticed several good outcrops of pure petroleum oil, which made long green streaks on the shores of the lake.

* In Stanford's map, roughly marked as Ahwachanjeeth pond.

Something might be made of these, as well as the abundant chrome-iron deposits which we afterwards saw near Mount Cormack, were transport not so difficult. At noon we continued westwards up steady water for 1¼ mile, and then entered a small pond of about three-quarters of a mile long, which we called Great Northern Diver pond, from the abundance of these fine birds which are to be found there. Continuing upstream, we reached another unmarked pond of about a mile long, which might appropriately be named Shoal pond from its extreme shallowness.

This being a good point from which to strike east over the unknown country at the headquarters of the Gander, I decided to cache the

ASCENDING THE EAST BAY RIVER.
(*Photo by J McGaw, Esq.*)

greater part of our stores on an island, where bears could not get at them, and to proceed northwards on the following day on a flying visit of a week's duration to Lakes Pipestone and Sit-down, Mount Cormack and its environs. Next day accordingly we travelled light with three canoes, and after spending a day in surveying the country to the east and marking the position of Look-out hill (850 feet), we continued up-stream for two days, reaching Pipestone on the evening of September 13. From Dead Man's rapids, a rough series of broken waters, the river was exceedingly difficult, and the men in constant trouble with the canoes, and at the rapids a portage of half a mile was found necessary.

Pipestone we found to be very unlike its aspect on the map. It lies

almost due north and south, and is equally divided into two sections, each about 1½ mile long, and divided by a narrow bar of stones some 10 yards wide. The country was flat, burnt, and exceedingly melancholy, with its great sea of burnt poles. The two highest mountains within our view were Mount Cormack and Sit-down hill, which we ascertained to be 1200 and 1150 feet respectively. In several maps Mount Cormack is placed about 4 or more miles to the east of Pipestone, but such we found to be quite incorrect, there being no mountain of any size in this direction. The best map (Stanford's) places it 4 miles due east of Pipestone, which is itself marked in such a fictional manner as to cause one to wonder if the geographer who arranged its form and direction had ever been within view of it. Pipestone lies due north and south in two sections, and Mount Cormack, as known to the Indians, lies due north of the lake, only a mile away. McGaw walked to the summit in half an hour and took observations, whilst I visited Sit-down pond (Enuchabeesh Gospen) and Sit-down hill, from which a magnificent view was obtained. Seven miles to the west the trees above Great Burnt pond could be seen, and just south of this rose a high mountain apparently as lofty as Cormack, and which I called Mount Frances. We spent another day in the Pipestone country, making sketches of the country and seeing great numbers of female caribou, and a great rarity in the shape of a jet-black fox. To the north-east we noticed a brook flowing into Sit-down pond, and this comes from a small pond which we called Joe Jeddore's pond, as Joe was the only man who had ever been there.

When it rains in Newfoundland, the heavens seem to open and let loose the water, not in buckets, but in ponds, and a day of this saw us, like drowned rats, retreating to Shoal pond, where we had left our stores. The following morning we made a start up the brook which leads to Dog pond. The heavy rain of the previous day had been of great assistance to us, for we found that the small stream up which we had calculated to pack was negotiable by canoes if carefully handled. We made about 5 miles that day, and in the evening found ourselves on a small lake, which is named Little Dog pond, where we had the good fortune to pick up a couple of wild Indian boys named Matthews, who were hunting caribou. After some parley, they agreed to come with us for a week or ten days, and to help us over the difficult country between Dog pond and the Gander. The next day we made Dog pond, where I killed a caribou doe, as we were quite out of fresh meat, and paddled to the north-east corner of the lake, where we camped for the night.

This point is close to the watershed of the two great river systems of Newfoundland. We could not, therefore, rely on water to help us for any distance on our eastward journey, except by using for a short spell the three small lakes that were said to exist between Dog pond and Burnt hill, a mountain overlooking the Gander at a point where I

hoped to again float the canoes. On the map this distance may be roughly estimated at 20 miles, but as the packers had to go the distance proved to be over 30 miles, whilst on foot and skirting the mountains to the south, McGaw and I found that we had walked nearly 40 miles.

After disposing of the stores and taking such things as would be necessary for myself and my companion for eight days, McGaw and I, with three Indians and Robert Saunders, set out on foot for the Gander river, intending to camp in a good hunting country that I had discovered in 1903. My plan was to shoot, if possible, two or three stags on the way and in the route of the oncoming packers, and thus supply them with fresh meat during their arduous undertaking. This we

MOUNT CORMACK FROM PIPESTONE LAKE.

succeeded in doing at suitable intervals of distance, and accomplished the march in three days, going hard all the time.

Soon after leaving Dog pond on September 17, we found that which we had most earnestly desired, namely, a stream flowing eastwards into the first of the lakes, which I took the liberty of naming McGaw's lake, after my industrious companion. By following this small brook back to its source, we can claim to have discovered the source of the Gander, the second largest river in Newfoundland, for the water system continues through the small lake chain to the eastward, and may be said to be a continuation of the main river, which had only been surveyed (by Howley) as far as Burnt hill. The actual source of the Gander comes from a small still pool surrounded by stunted spruces, and McGaw took an excellent photograph, which is here reproduced (see p. 891).

To the south of Lake McGaw we ascended to the summit of Partridgeberry hill, the highest mountain in Central Newfoundland, and obtained a magnificent view in all directions. The air was so rarefied that it was possible to make out Mount Peyton, or Blue hill, as it is called by the Indians, 70 miles away to the east. To the north Mount Lawrence and Joe Migwell's hill stood out by themselves. The great valley of the Gander lay at our feet, and we could trace its sinuous course for 20 miles from its source, through the lakes of McGaw and Rocky pond, to the widening "Steadies," beneath Burnt hill, 8 miles to the east, where it was lost in the green woods. All around us were rocky barrens and small marshes, across which countless caribou trails led away to the south, for this is a great migration route of the deer when they begin to travel. We continued all day eastwards, reaching Burnt hill at sunset. Beneath the mountain we flung ourselves wearily on the ground amongst the abundant blueberries, and thought of camping, when one of the Indians saw a stag right on the top of Burnt hill. Joe released from his pack was like a greyhound loosed from the slip, and the way he led me up that mountain after a 20-mile walk I shall not easily forget. However, I slew the stag, and we returned to the small woods, where we found McGaw had made a comfortable camp. The next day, September 18, we continued our journey over hard ground, and at midday McGaw killed his first stag, in a position that it could be easily utilized by our packers. That night we made the edge of the green timber, and camped close to a splendid beaver colony, whose occupants seemed to recognize the fact that they were protected, for they stared at their visitors with no unfriendly eyes.

The next day we journeyed down the ever-widening river, and at mid-day I killed another stag, and in the evening we reached the spot which had been my highest camp in 1903.

On the following day the Indians and Bob left us to our own devices, and returned to meet and help the packers, whilst McGaw and I hunted on the Gander for five days, and awaited the coming of the packers. During this period we killed three nice heads. On the night of the 24th the men turned up with the outfit. They had met with no accidents, but had experienced an arduous journey for eight days since leaving Dog pond. The river itself had proved nothing but a series of shallows and rocky benches, in which it was unsafe to drag the canoes, so that the men had been forced to pack nearly the whole distance. The three stags had been of great comfort to them. They had devoured the whole of the edible parts, and this had given strength to do the work.

As my friend McGaw had only one more stag to kill under the terms of his licence, and was also anxious to catch an early steamer for home, he left me on September 25, and, travelling down the swollen Gander, reached Glenwood on October 2.

I now set to work for eleven days to hunt seriously for big heads, and to explore the nature of the country westwards as far as Great Rattling brook, and southwards in the angle formed by the junction of the Little Gull river and the Gander on one side, and Great Gull river and the Middle ridge on the other, working as far east as Serpentine peak. This area is practically unknown, and in it I found a small chain of four uncharted lakes, connected by a small stream, which joins the Little Gull about a mile from its debouchment into the Gander. Both the Little and Great Gull rivers start from two lakes situated within half a mile of one another under the western edge of the range known

THE SOURCE OF THE GANDER.

(*Photo by J. McGaw, Esq.*)

as the Middle ridge, the former flowing north and the latter north-east, where it joins the Gander about 3 miles below Rolling falls. In this angle formed by the starting-point of the two rivers rises a hill known to the Indians as Berry hill. The course of the Little Gull is short and swift, and after the first mile from the Gander it is exceedingly rocky, and would be difficult, but not impossible, to explore in canoes if there was plenty of water. The Great Gull pursues a more even course through a beautiful wooded valley, and on its lower reaches there are many "steadies."

The great outcrop of serpentine rocks known as Serpentine hills is a curious formation, and seems to give promise of mineral wealth, but so far the only two prospectors who have visited it have met with

disappointment. Walking eastward from Serpentine peak one day, I found a good sheet of water named Harvey's lake, between Child's pond and the Great Gull. This connects with the Gander about a mile above the confluence of the Great Gull. I spent two days at Migwell's brook, so as to visit the ponds from which the stream is said to take its origin, and found that at a distance of 5 miles from the Gander, the brook branched and came from two small ponds half a mile apart. A similar origin takes place in the stream known to the Indians as Rolling brook, which enters the Gander at Rolling falls. From this point out to Glenwood the river and its environs are fully mapped, so that I need say no more. The weather breaking on October 10, I made for Glenwood, which I reached on October 14, after a very delightful trip across Newfoundland from the south to the east coast, a journey which has only previously been accomplished by one white man.*

REPORT OF THE INDIAN SURVEY COMMITTEE, 1904–1905.

It is no secret that the members of the Indian Survey Committee were not altogether in agreement as to the methods on which the proposed departmental reforms were to be carried out, but the general character and scope of those reforms seem to have offered no difficulty in principle, and they do not differ very widely from previous suggestions made to the Indian Government on more than one occasion within the last fifteen years or so.

The recurrent process of starving the Survey Department in order to meet treasury demands in times of financial pressure had resulted in inefficiency of service both in the field and in office. Whilst the demand for maps has been steadily increasing from year to year, the power to produce those maps had been decreasing both in men and money. Old mapping that was in need of revision was set aside or patched by the crude efforts of untrained employees, working under the local civil administration, with disastrous results; and the military mapping of the frontier, from the Indus to Persia, was confided to one working party with two military officers for its guidance.

The results of the committee's recommendations are mainly the strengthening of the department in all that appertains to the topographical or military mapping of India, and the separation of that branch of surveying from the cadastral or revenue surveys which are henceforth to be undertaken by local civil administrations, but will be under properly trained supervision from the central department. The

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* A minor named Guzman left Despair Bay in 1873, under the guidance of Nicholas Jeddore, a Micmac Indian, and reached Glenwood by this route.

necessity for an accurate geodetic basis for all surveys is not lost sight of, and this, with much cognate scientific work demanding the close attention of specialists and experts, will probably retain the position which it has always held in the curriculum of the department; only now it will be secondary in importance to the one paramount necessity for maintaining a complete and thoroughly up-to-date one-inch map of all India, and of all the frontier within the Indian political sphere of influence. In short, military considerations predominate, and the committee's recommendations, on the whole, seem well adapted to meet military requirements. So long ago as 1876 a Secretary of State for India pointed out to the then Indian Government the fallacy of expecting to effect economies by the reduction of survey establishments which had cost much in the training, and which could not be replaced again for years. Nevertheless that fallacy was supported by that Indian Government, and it has found supporters ever since. The opportunity of paying rather expensively for the luxury of maintaining it has now come. Instead of one frontier survey party and two officers to deal with all the vast extent of the Indian borderland (as well as with much that lies beyond it), there are to be five such parties with three officers attached to each; and the superintendent of frontier surveys is to hold an administrative position equalling that of the superintendent of trigonometrical surveys. The headquarters of frontier mapping is to be at Simla, in close touch with the Intelligence branch of the Quarter-master General's department, as, indeed, it used to be some years ago. Why that useful arrangement was ever disturbed it is difficult to say. It is clear that the influence of Lord Kitchener (himself a surveyor) has been strongly exercised in favour of a complete knowledge of frontier geography.

It only remains now to ensure that the improved and extended maps of the frontier find their way into the right hands. The distribution of information is no less important than its acquisition. Hitherto it has been held sufficient that the sources of information should be all gathered in at one fountain-head, with little or no outflow into the thirsty regions of the frontier. Officers commanding frontier stations were often lamentably ignorant of their own immediate geographical surroundings. This, however, is a branch of the subject with which the committee did not deal.

A most useful innovation is the increase in the number of officers who will pass through the practical survey school owing to the limitation of the period during which they will serve in the department. This promises well in future for the distribution of a large number of comparatively young officers throughout the Indian army who will have learnt the art of topography in the best of all practical fields. Probably there will be found hereafter in the ranks of the Intelligence Branch a few skilled topographers who really know how to make a map as well as how to use it. They have been long wanted.

The committee deals carefully with the all-important question of map-reproduction, but it cannot be said that their recommendations under this head are more than tentative. It may be that the partial engraving of maps and the introduction of heliozincography to replace the useful but crude processes of photozincography, will go some way towards the improvement of Indian mapping. The original field sheets are often works that would rank high anywhere in the artistic world of "black and white." They are not infrequently almost perfect expressions in pen and ink of the physical features which they illustrate. But from the hands of the printer they emerge in crude unfinished-looking sheets which might well lead to an impression of absolute inaccuracy. Nor is this necessarily the fault of the printer. Climate, material, and economy are against him—especially economy. You cannot get, in Calcutta, maps equal to the best class of English cartography at less than one-half the cost of the latter. If the immense mass of Calcutta reproductions is balanced against the attenuated office staff (European and native) that are responsible for it, it would probably be found that Calcutta is the cheapest reproducing office in the world. Nevertheless, when all is said, the conditions of climate will still remain prohibitive to the best class of map-reproduction.

A list of the chief recommendations of the committee is appended.

(1) Immediate preparation of a one-inch map of India.

(2) The number of topographical parties to be fixed at fifteen.

(3) Special arrangements to be made to complete the work required near the North-West Frontier within the next six years.

(4) Cadastral and other large-scale surveys to be left entirely to the local authorities, and the cost of all special forest surveys to be debited to the Forest Department.

(5) The question of handing over tidal work to the local authorities to be considered.

(6) Deputy surveyor-general to be given an assistant, and the post of assistant surveyor-general in charge of the Survey Office to disappear.

(7) The surveyor-general to be allowed an inspecting officer.

(8) Surveys beyond the frontier to be placed directly under a superintendent of frontier surveys occupying a position similar to that of the superintendent of trigonometrical surveys.

(9) The post of superintendent of forest surveys to lapse.

(10) The trigonometrical branch to be strengthened by two officers.

(11) The strength of the field parties to be increased fifty per cent.

(12) Each ordinary topographical party to have two officers, one in charge and the other to be his assistant, and frontier parties to have three officers.

(13) To meet these proposals the strength of Imperial Service for topographical and trigonometrical work to be increased from forty to seventy officers.

(14) First appointments of army officers to the Imperial Service to be for five years, and a language test to be imposed.

(15) The Provincial Service to be divided into two services, a Provincial, or Indian, Service, and a Junior Service, the pay of the former to range from 250 rs. to 800 rs., and that of the latter from 80 rs. to 400 rs., and some modifications in recruiting to be introduced.

(16) Indians to be employed in a certain proportion of the Provincial and Junior Services.

(17) Imperial and provincial officers employed on cadastral or similar work to be seconded, and their places filled in the department.

(18) An additional officer to be appointed as an assistant to the officer in charge of the photographic and lithographic office, the two to then include the mathematical office in their charge.

(19) Local governments to reproduce their own cadastral maps, and no drawing of extra departmental work to be thrown upon the Survey of India Office.

(20) The question of the removal of headquarters from Calcutta to be postponed for the present.

T. H. H.

REVIEWS.

ASIA.

Turkestan and Persia.

'Explorations in Turkestan, with an Account of the Basin of Eastern Persia and Sistan.' Expedition of 1903, under the direction of Raphael Pumpelly. 4to. Washington: 1905. *Maps and Illustrations.*

This work, a massive volume of 324 quarto pages, excellently illustrated with maps, photographs, plates, and diagrams, forms a most valuable contribution to geographical science. It is published by the Carnegie Institute of Washington, and records the geographical work of an expedition sent out by that institute in 1903, under the direction of Mr. Pumpelly, "for the purpose of making a preliminary examination of the Trans-Caspian region, and of collecting and arranging all available existing information necessary in organizing the further investigation of the past and present physico-geographical conditions and archæological remains of the region." The reasons for selecting this particular field for research are stated to be—(1) The existence of a school that still holds the belief that Central Asia is the region in which the great civilizations of the Far East and of the West had their origins; (2) the supposed occurrence in that region in prehistoric times of great changes in climate, resulting in the formation and recession of an extensive Asian Mediterranean, of which the Aral, Caspian, and Black seas are the principal remnants.

The party consisted of Mr. Raphael Pumpelly, with Mr. R. W. Pumpelly as his assistant; Prof. William M. Davis, Sturgess Hooper professor of geology Harvard University; and Mr. Ellsworth Huntington, Carnegie research assistant. Each of the above has contributed separate portions of the volume. The space at disposal is inadequate for more than a brief reference to each.

Mr. Raphael Pumpelly himself furnishes a paper on "Archæological and Physico-Geographical Reconnaissance in Turkestan," in which he states the purposes of the

expedition, sums up the conclusions arrived at by each member of his party, and propounds recommendations regarding the scope of future investigations. He does not appear to have done much individual research in this expedition, but his remarks on such personal observations as he made of the old tumuli and sites of ruined towns are very interesting.

Prof. Davis's contribution is styled "A Journey across Turkestan," and records observations made on a journey from the Caspian to Askhabad, the Kopet Dagh mountains, Merv, Samarkand, Tashkent, Andijhan, across the Tian Shan mountains to Lake Issik-kul, and thence homewards *viâ* Vyernji and Omsk to St. Petersburg. The time spent in Turkestan was from May to August, *i.e.* three months. From an authority of wide-world renown such as Prof. Davis we naturally expect observations and conclusions of great interest and value, and those expectations are here fully realized.

Mr. R. W. Pumpelly contributes "Physio-geographical Observations between the Syr Darya and Lake Kara-kul on the Pamir," wherein is recorded observations made on his journey from Osk *viâ* the Kizil Art pass to Kara-kul and back, June 23 to July 17.

To Mr. Ellsworth Huntington we are indebted for not only two, but the two largest portions of the volume. The first, "A Geological and Physio-graphic Reconnaissance in Central Turkestan," presents the results of a journey of two months—August and September—from the Issik-kul lake, over the Tian Shan range, to Chadir Kul and Kashgar; thence *viâ* the Terik pass to Osh, to Karategin in the Alai range, and northwards to Marghilan. The second, under the title of "The Basin of Eastern Persia and Sistan," records the observations made on a journey of three and a half months (November, 1903, to March, 1904), from Transcaspia to Seistan and back. Among the principal physical phenomena brought to notice by the above observers are the following:—

Prof. Davis reports traces of an old shore-line about 600 feet above the western shore of the Caspian sea, and a very distinctly marked one about 200 feet above the east side of the same sea. In the mountains near Issik-kul he claims to have found clear evidence of two, and probably three, glacial epochs.

Mr. Huntington, in the higher Tian Shan, found proof of three, and later in the Alai range of five, glacial epochs, between some of which there were long interglacial intervals. He reports records of climatic oscillations, shown not only in moraines, but in valley terraces, and considers these to be members of a group of sympathetic glacial phenomena.

Prof. Davis has noted in the Kopet Dagh and eastern mountains evidence of longitudinal dislocation accompanied by great block uplifts, formed apparently after the wearing down of the mountain masses to a peneplain, and preceding an active dissection of the elevated mass.

Mr. R. W. Pumpelly reports evidence in the Alai of a block uplift, followed by a block tilt, both with a dislocation to the north. He correlates these movements with the glacial geology, making the block tilt an interglacial event.

The conclusions finally arrived at by the expedition as a whole are, that the recent physical history of the region is legibly recorded in glacial sculpture and moraines, in orogenic movements, in valley-cutting and terracings, in lake expansions, and in the building up of the plains, and that progress has been made in correlating these events, inasmuch as the block uplifting and tilting have been correlated with the growth of the Fergana lowlands, and the relation of the glacial expansions to the valley-cuttings in the Trans-Alai range has been clearly recorded. Full information is claimed to have been found of a progressive desiccation of the region from a remote period. Abandoned sites, great and small, of human

occupation, evidently of great antiquity, have been found widely distributed, and it is concluded that a correlation of these physical and human events may be obtained through a continuance of the investigation, and that archæological excavations will throw light on the origin of Western and Eastern civilizations.

The above brief sketch of the work and records of the party under Mr. Pumpelly will suffice to bring to notice a remarkable advance in the scientific treatment of the physico-geographical problems of a country. However virgin a field of research Turkestan may be, one cannot but be greatly impressed by the mass of new information collected and recorded by the present expedition in the making of what is claimed to be but a preliminary reconnaissance of the country. If so much has been done by systematic and scientific observation in journeys of such short duration, we are indeed justified in expecting important results from further and prolonged exploration conducted under the same scientific system. It is, however, only reasonable to expect that some at least of the conclusions now formulated will be modified by further research.

The geographical world will look with interest for the records of further work by these same authors, and it is greatly to be hoped that other geographical communities may be tempted to conduct physico-geographical research on the advanced scientific principles adopted by the Carnegie Institute.

A. H. M.

AFRICA.

The Masai.

'The Masai: their Language and Folklore.' By A. C. Hollis, with introduction by Sir Charles Eliot. Oxford: 1905.

None of the Central African peoples revealed to the outer world during the latter half of the nineteenth century have received more careful and adequate treatment than the Masai nomads, whose outstanding physical and mental characters, social and military institutions, religious notions and traditions could not fail from the first to attract the attention of anthropological students. The graphic picture presented by Joseph Thomson's 'Masailand' has been greatly enlarged by Merker's 'Die Masai,' lately noticed in the *Journal*, and is now all but completed by the present work, the value of which is not a little enhanced by Sir Charles Eliot's comprehensive survey of the whole field. This is all the more timely since the people themselves are, under various adverse circumstances—rinderpest, small-pox, famine—steadily declining, their numbers having in recent years fallen from perhaps 50,000 to scarcely more than 12,000 in the British section of their former domain. It was, in fact, this threatened extinction or fusion of the race in the surrounding Bantu populations that inspired the present work, in which Mr. Hollis has sought, before it was too late, to give a full account of the language, "the customs and beliefs of this interesting people, all given in the words of the relaters themselves." The result is most satisfactory, and Sir Charles Eliot is fully justified in declaring that the book is one of the most valuable contributions yet made to the anthropology and philology of British East Africa.

Sir H. Johnston's suggestion that the Masai are an early blend of Nilotic Negroes and Galla and Somali Hamites is here accepted as probably correct. This view at once explains the curious intermingling of Negro and Caucasic physical characters that has been noticed by all observers, and at the same time accounts for the peculiar structure of the Masai language, whose affinities are here shown to be with the Bari, the Latuka, and other Nilotic tongues, and not at all with

the Hamitic family. The inference is obvious that the substratum is negro, while in the process of somatic fusion there has been no linguistic fusion, but one of the two rival languages has simply perished, in accordance with the principle always insisted on by me that, while all races normally intermingle, there is no true linguistic miscegenation ('Ethnology,' ch. ix.).

In his treatment of the Masai language, Mr. Hollis has adopted a highly practical method, by which the laws regulating the formative and other structural elements are stated in the fewest possible words, and then illustrated by copious examples. The rigid and unnatural distinction drawn in most grammars between accidence and syntax is thus got rid of with excellent results, and without any sacrifice of clearness. Since the sentence, and not the word, is the true unit of speech (Sayce), it must be obvious that this is the real scientific method, and the student will be all the more grateful to Mr. Hollis for having extended it to the whole of the volume. The numerous Masai texts, comprising cosmic myths, moral and religious tales, folklore stories, proverbs, riddles with their answers, and the like, are generally given with interlinear verbatim translations, and then followed by free English versions, so that this second and larger section of the volume serves as a continuous application of the grammatical rules occupying the first part. Some of the tales and wise saws bespeak a people gifted with a fair share of natural intelligence, and far from destitute of a measure of moral sense fully adequate to the maintenance of their by no means primitive social conditions. Thus "the night has ears" = our "walls have ears;" "the charcoal laughs at the ashes" = "hodie mihi cras tibi," or "your turn next;" "the arrows come by the hind-leg," *i.e.* if arrows come, there are foes behind them, = "no smoke without fire;" "we begin foolishly and end wisely" = "experientia docet." And here is just one riddle—What escapes the prairie fire? The bare spot (where no grass grows).

A. H. KEANE.

THE WESTERN SUDAN AND NIGERIA.

'A Tropical Dependency: An Outline of the Ancient History of the Western Soudan, with an Account of the Modern Settlement of Northern Nigeria.' By Flora L. Shaw (Lady Lugard). London: Nisbet. 1905. Pp. viii. + 508.

Miss Shaw, now Lady Lugard, will long be remembered as the brilliant correspondent of the *Times* on Colonial affairs. To the composition of this more solid piece of work she has brought to bear the same remarkable qualities—thorough grasp of the subject, clearness of exposition, and an easy fluent style—which made her Articles such pleasant and instructive reading. To these has here been added an unwearied industry in the collection and discriminating study of the copious materials which had to be consulted in the preparation of the present work, which covers an immensely wide field, far wider even than might be gathered from its rather full explanatory sub-title. This will at once be seen when it is stated that the 'Outline' is by no means confined to the 'Western Soudan,' but ranges over the whole of North-West Africa and Spain, thus enabling the gifted writer to deal intelligently with the manifold relations which Arabs, Berbers, and Europeans have had with the Negro and Negroid peoples between the Atlantic and Lake Chad throughout the historic period. It is a tremendous programme, and the wonder is that the author did not break down under the weight of her self-imposed burden. Within the elastic framework of this kaleidoscopic picture are comprised such varied and often obscure topics as the spread of Islam throughout North Africa and Iberia; Arab and Berber political and cultural supremacy in Spain; the successive rise and fall of the strictly Sudanese empires of Ghana, Melle, the Songhay, Hausas, Fulahs, Kanembu, and Kanuri (Bornuans); possible early

Egyptian (Pharaonic) influences in the Hausa lands; Europe in West Africa; European and local slave trade, slave raiding, and domestic slavery; the Royal Niger Company; Northern Nigeria, its settlement, economic relations, and prospects.

Uniform excellence in the treatment of such diverse subjects was not to be expected, and it will perhaps be generally felt that the book would have been all the better for a little pruning. Certainly those sections dealing with the shadowy Egyptian relations had better have been omitted, and here, I think, too much confidence has been placed in M. de Lauture's rather wild speculations regarding Asiatic traditions, and in M. F. Dubois' still wilder theories about Pharaonic invasions and settlements in Western Sudan. The *Ungaras*, "of whom many were Fulani," are associated with the Indian epic of the Ramayana, because of a Raja of *Ungar*, which "must have been a province of Persia," while the origin of the Fulani themselves must also "be sought in India (de Lauture), although they had previously been identified with the Arabian Wahabi (Denham). Nor is Heeren quite a safe guide, besides being a little out of date.

But with this and one or two other reservations on secondary matters, the rest of the volume, say nine-tenths of the whole, dealing also with those questions for which it will be mainly consulted, must be spoken of in language of unstinted praise; and this applies in a special manner to those instructive and eminently readable chapters which deal with all the native empires, with the overthrow of the Askian dynasty (Songhay) by the Hispano-Moroccan "Moors," with the overthrow of the Fulah emirs by the British, and with the resultant settlement of Northern Nigeria. In this last section there is a pleasant note of reasoned optimism, which ensures the sympathy of those at least who "think imperially," while at the same time conveying a well-earned tribute of recognition to Sir George Goldie, her husband Sir Frederick Lugard, and the other officials engaged in the rough and too often thankless pioneer work of empire-building in Central Africa. The staff, she remarks in one place, "was chiefly composed of that fine type of young Englishmen who, whether as soldiers or civilians, have it in their minds to serve their country to the best of their ability, in some adventurous capacity which will take them out of the common round of comfortable life. Their experience of Africa was mostly *nil*, but they had the training of the public school, the army, and the university, which fits men equally for the assumption of responsibility and for loyal subordination to authority. They were ready to go anywhere and to do anything, and . . . represented, in the eyes of the High Commissioner, the very best stuff of which the English nation is made."

An agreeable feature of Lady Lugard's style is the terse and epigrammatic way in which general conclusions are often summed up, which adds not a little to the charm of the work. After the capture of Kano and Sokoto, she writes, "The trial of strength had come and gone. The Fulani emirates were in our hands, and Great Britain was the acknowledged sovereign of Northern Nigeria." The political change suddenly brought about in a region several hundred thousand square miles in extent, with a population of many millions, is thus adequately stated in three lines. Again, after pointing out the wasteful character of transport by human agency, she adds, "Human carriage is a concomitant of slavery. With the abolition of slavery it becomes impossible." And reference is made in the same succinct way to the wise policy of ruling, "as far as possible, through the existing Fulani and Bornuese machinery, modified and controlled by the advice of British residents." Here is revealed in a few words the secret of the astonishing ease and rapidity with which the *pax Britannica* has been securely established throughout this great "tropical dependency."

Owing, evidently, to the frequent use of French documents, a faulty orthographic

system somewhat disfigures the text, though it has fortunately not ranged into the two large and most accurate maps supplied by Mr. Stanford. Thus we have Soudan and Sudan, Timbuctoo and Timbuktu, Audoghast for Audaghost (Barth), Cairouan for Kairwan, and other irregularities which should disappear in future editions. Then, also, the short index might be usefully enlarged.

A. H. KEANE.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

PRACTICAL ASTRONOMY.

'Handbuch der Geographischen Ortsbestimmung für Geographen und Forschungsreisende.' Von Dr. Adolf Marcuse (Privatdozent an der Universität Berlin). Mit 54 in den Text eingedruckten Abbildungen und 2 Sternkarten. Braunschweig: Druck und Verlag von Friedrich Vieweg und Sohn. 1905. *Price* 10 *Marks.*

Notwithstanding the rapid extension of surveys based upon triangulation, there are still many regions of the Earth where it would be impossible to obtain accurately fixed points for commencing a survey, and where consequently a geographical surveyor would have to depend upon his own astronomical observations for the determination of his initial positions. Hence it is most important that he should previously make a thorough study of the methods best suited for this purpose, and to that end such a work as Dr. A. Marcuse, of Berlin, has just published should prove of great assistance to him. It is true that many books of a somewhat similar character have appeared in recent years, but there are in this some special features that should recommend it to geographical surveyors and students of mathematical geography generally. It is essentially a book for students, and although it contains examples of the ordinary astronomical observations for the determining of latitude, longitude, and azimuth, it is more suitable for previous study than for actual practical work in the field. The methods described for the determination of latitude are for the most part those in general use, but the longitude observation from altitudes of the moon has of late years been practically discarded in this country on account of its unsatisfactory results. With larger and more exact instruments than those usually carried by travellers better results might doubtless be obtained, specially when the observations are properly balanced; but even then, and after the necessary corrections have been applied to the lunar tables, it is doubtful if the results of the observations would justify the time and labour spent upon them. With the exception of the occultation of a star, the methods of obtaining longitude which depend upon the moon's motion must be considered far too unreliable for the present time, and the character of work now required

In the section of Dr. Marcuse's book entitled "Rechnerische Hilfsmittel zur Geographischen Ortsbestimmung" is given a brief description and summary of contents of the principal nautical almanacs and ephemides of different nations, as well as of various logarithmic and other tables arranged to assist in the computation of the observations.

In the third part of the book will be found a more than usually complete account of the principal instruments used in practical astronomy, with excellent illustrations. The description of the chronometer given here is specially good, as is also that of the various angular measuring instruments and levels.

Towards the end is given a chapter on the approximate computation of observations by means of Mercator functions (or meridional parts), another on methods of determining the position in aero-nautical navigation, and a third on rough methods of observation without angular measuring instruments. There are also

two star maps, one of the northern and the other of the southern constellations; but these have little to commend them, except that they are free from the grotesque figures representing the constellations which used too frequently to obscure such maps.

THE GEOGRAPHY OF EARTHQUAKES.

'F. de Montessus de Ballore: Les Tremblements de Terre' Géographie Séismologique, Avec un Préface par M. A. de Lapparent. Pp. v + 475, 3 *maps*, 89 *figures in text*. Paris: Armund Colin. 1906.

For years past the author of this work has poured forth a copious stream of memoirs, dealing with the distribution of earthquakes in one country after another, and now we have the coping stone of the edifice. Inspired by no mere love of statistics for their own sake, Comte de Montessus has left to others the study of the nature and effects of earthquakes, and has attempted, by a study of their distribution in space and time, to reach their cause, but as geographers are more concerned with the distribution of earthquakes, we may be pardoned for attaching greater importance to the means than to the aim of our author's researches, and in this connection he has brought out one noteworthy point—that nine-tenths of the whole number of earthquakes originate along certain narrow bands. Most conspicuous of these narrow bands, along which most of the seismic areas are distributed, is that which commences in the western Mediterranean and extends through the Alps, Caucasus, and Himalayas to Arracan, a continuation being seen in Java and Sumatra; from the southern end of the Caspian it sends out an offshoot running up into the Kuenlun mountains, and two isolated patches, one round Lake Baikal, the other in Central China, complete the seismic districts of Asia. Outside Asia proper comes the great girdle of the Pacific, running from Borneo through the Philippines, Japan, the Kurile and Aleutian islands to Alaska; it becomes interrupted along the western coast of North America, though California is classed as seismic, as is the western part of Central America and the west coast of South America. An offshoot from this land runs into the Antilles and possibly beneath the Atlantic, where submarine earthquakes are known to occur with some frequency, to the western end of the Mediterranean band. Outlying seismic districts are, New Zealand, which may form a portion of the Pacific girdle, Florida, the Indus delta, the hills of Madagascar and Central Abyssinia; with the exception of the coast districts of Morocco and Algiers, this is the only seismic district in Africa, a continent which is, as a whole, peneseismic or aseismic. When the smallness of these areas is considered, forming apparently not more than one or two per cent. of the whole surface of the globe, the large proportion of earthquakes originating from them is remarkable, and may be expressed by saying that earthquakes are frequent and severe in those regions where great tectonic changes have recently taken place, and are less frequent in proportion as these are of earlier date and have more or less completely died out.

R. D. O.

GENERAL.

LIFE OF ALFRED RUSSEL WALLACE.

'My Life: A Record of Events and Opinions.' By Alfred Russel Wallace. Large 8vo. 2 vols., pp. 485 and 459. *Map, Portraits, and Illustrations.* London: Chapman & Hall. 1905.

In recording his impressions of a tour in Switzerland, the veteran zoologist, whose two large volumes of autobiography lie before us, thus expresses himself:

"The appreciation of Nature grows with years, and I feel to-day more deeply than ever its mystery and its charms." Some might therefore look in the life-story of the writer who gave us 'The Malay Archipelago' and the essays on 'Tropical Nature' for a more apparent manifestation of such appreciation than is here to be found—a perceptible undercurrent of recognition, as it were, of what a recent writer has termed "the call of the wild." But probably we have no right to complain of the fare provided. Dr. Wallace had many interests besides those of science, and he was right not to go over the ground already traversed in his published books and papers, which are quite accessible.

In the earlier part of the work we have a long excursus on Robert Owen's work in New Lanark, and a whole chapter upon Jack Mytton, with whom the author was not even contemporary; while later there is a good deal which scarcely touches on the author's life, such, for example, as the answers, amusing enough though they may be, for which the British schoolboy is responsible while under examination. Other subjects there are, too, interesting, no doubt, in themselves, such as land-nationalization and mesmerism, which occupy even more space. But we must here confine our notice to those parts of the work which fall more legitimately within our scope.

It is a significant fact that Dr. Wallace found geography one of the most painful subjects he was ever called upon to master at school. No interesting details concerning the countries were ever taught him, he says, and no good maps ever shown—"nothing but a horrid stream of unintelligible place-names." An interest in countries and places unknown to him, and some knowledge of topographical geography, were nevertheless gained by dissected maps of Europe and England, which were among his toys—a point which teachers in geography would do well to lay to heart. For the most part, however, he had to make his own toys, thereby acquiring a manual dexterity which stood him in good stead in his travel days, scarcely less, indeed, than did his early experiences as a land surveyor.

Most persons destined to make a name for themselves as naturalists give early evidences of their tastes, and begin collecting as children. Dr. Wallace reached the age of eighteen apparently before he gave more than a casual thought to bird, or beast, or flower; and this notwithstanding that his work perforce led him to the fields and hedgerows. Curious indeed is the story of how, almost suddenly, he came to develop an interest in plants, and how the mere description, not the sight, of *Dendrobium devonianum*—certainly one of the most fairy-like of orchids—first aroused in him a wish to visit the tropics, combined with his reading of Humboldt's 'Personal Narrative.' Malthus's 'Principles,' which came into his hands about this time, was the source, he considers, whence twenty years later he obtained the long-sought clue to the effective agent in the evolution of species.

While schoolmastering in Leicester in the year 1844, the author first met Bates, and the study of the latter's collection of beetles drew his attention to another branch of natural history, and ultimately brought about the Amazon journey. But it is remarkable that before this, and when he had been interesting himself but a very short time—not more than four years—in natural science, he had already begun to speculate upon the origin of species. The Amazon journey is dismissed in a single chapter, and the long years spent in the Malay archipelago in two. Dr. Wallace no doubt thinks, and rightly, that his previously published accounts are sufficient. With these outlines, then, we come to the second volume, which opens with what is practically the most important chapter in the book. It bears the name of Darwin at its head, and gives some unpublished letters of the latter, but most of the ground is, of course, covered by the "Life and Letters,"

and there is but little that is new to the student of the history of the hypothesis which we now talk of as Darwinism. Dr. Wallace carefully sums up the differences between his own theories and those of his fellow-discoverers; and, indeed, not the least interesting part of the book is where he discusses his impressions of Huxley, Darwin, Herbert Spencer, and others of the band of great scientific thinkers of whom he is now the sole survivor.

After a rather lengthy account of a tour in America, we pass beyond the domain of geography, and are led *viâ* land-nationalization to socialism, and thence to spiritualism and antivaccination, whither we need not follow. At first we may feel a shade of regret that we cannot exchange these subjects for others more germane to the sciences to which the author was so distinguished a contributor, but perhaps it is better so. Out of the abundance of the heart the mouth speaketh, and the autobiography would lose its value as a human document were the author's own perspective to be disregarded. Dr. Wallace's volumes are of very real interest, it is needless to say, to the philosopher and the political economist as well as to the zoologist and to the geographer.

THE MONTHLY RECORD.

EUROPE.

France and the Simplon Route.—In view of the approaching opening to public traffic, on June 1 next, of the Simplon tunnel route, the discussions on the steps to be taken to bring the French railway system into relation with the new international route continue to be maintained with much vigour. As is well known, the idea of a direct route across the Jura by the Faucille has found strong partisans, both in France and Switzerland, while others are equally strongly opposed to the scheme. The latest contribution on the part of the opponents of the Faucille route is a paper by Prof. Brunhes, of Fribourg, in the *Revue Économique Internationale* for February, 1906 (also reprinted as a brochure). Prof. Brunhes is well known as a writer on economic geography, and he puts the case against the Faucille scheme with much force, and, in the absence of a counter-statement by the supporters of the scheme, in a convincing manner. The paper is illustrated by maps, which help to bring the salient facts in the question strikingly before the eye. Having touched upon the desirability of bringing France and the French-speaking part of Switzerland into closer relation, he maintains that from every point of view the route *viâ* Vallorbe and Lausanne (the shortening of which by a tunnel through the Mont d'Or, between Frasne and Vallorbe, was provided for by an agreement between France and Switzerland in 1902) has the advantage over that by the Faucille and Geneva. Not only would the cost of the first-named scheme be incomparably less—as it requires only one tunnel of 6225 metres instead of three, each of greater length, and one of them longer than either the St. Gothard or Mont Cenis—but the actual distance involved in the through journey from Paris to Milan would be 40 kilometres (25 miles) shorter, or 17 kilometres (about 10 miles) even without the proposed improvements by the Mont d'Or. It has been maintained that the gradients, etc., on the Vallorbe line would be such as to unfit it to serve as an international route, but Prof. Brunhes points out that, although somewhat greater than on the proposed Faucille line, they are still far less serious than those on the Simplon line, to say nothing of the St. Gothard and Mont Cenis. As to the extent of French territory which would be served by the Faucille route, he

holds that the statements which have been made are thoroughly illusory, for even were the Faucille line made, the greater part of the traffic from northern and western France would still go by the shorter routes to the north and south of it. Still another objection to the Faucille route would be the necessity, in order to avoid the *détour* by the north shore of the Lake of Geneva, of a connection between the two French lines approaching Geneva from opposite sides, the supply of which would be a matter of great, if not insuperable, difficulty. Meanwhile the existing Vallorbe line will certainly be used for through traffic from France to the Simplon, and the people of Geneva are already agitating for an express service to Paris by the line connecting with the same route west of Lausanne.

Remains of Wends in Mecklenberg.—A monograph by Dr. Hans Witte, keeper of the archives of the Grand Duchy of Schwerin, recently published as a part of the *Forschungen zur deutschen Landes- u. Volkskunde* (vol. 16, No. 2), traces the remains of Wendish population in Mecklenberg. Before 1160 East Elbeland was completely Wendish. In the second half of the thirteenth century it was apparently completely German. It may be thought that this sudden change was brought about by the German migration and the consequent war of extermination. But was the extermination of the Wends complete to the letter? Three accounts are cited. One assumes that the Slavs of East Elbeland were a race of rulers imposed on a pre-existing German population, and that, like the Franks, Goths, and Lombards, the Slav rulers gradually adopted the nationality of the subject race. In face of the overwhelming documentary proof of a Wendish occupation of the region, this view is summarily dismissed. For instance, in the charter of the cloister of Dargun (1174), the frontier places enumerated are pronouncedly Slavonic. The names of places in the Schwerin bishopric, 1178, are exclusively Slavonic, and all the evidence points to the same conclusion. An opposite view is that not only down to Henry the Lion was there a purely Slavonic population, but that they survived the war of races, and that the East Elbians are still in the main German-speaking Slavs. The German immigration in the middle of the twelfth century, and the terrible thinning of the native Wends, seems, however, altogether beyond dispute. A third view recognizes, after the complete subjugation of the Slavs, a veritable war of extinction. Denied German rights and Germanization, the Slavs were driven wholesale from their soil, which was then converted into German settlements. An event of such historic importance, as also of much geographical significance, seems now in a way to be conclusively settled. Dr. Witte has ransacked the Ratzeburg tithe-register of 1230, as well as the huge volumes of Mecklenburg documents. His investigations include in their scope Slav remains in the Ratzeburg see according to documents of later date than the register; evidence of Slav settlement in Eastern Mecklenburg; topographic and personal nomenclature; peculiar construction of Slav settlements. Again, wherever a division of fields by hides is found in operation, there a preponderant German element is to be inferred. The division by "Hakenhufen," a measure of 15 acres, on the other hand, is characteristically Wendish, and wherever found in operation, the existence of a preponderant Wendish element is to be inferred. A map is given at the end of the paper, on which are graphically shown (*inter alia*): (1) Places with Slav population and the frontier of a continuous Slav territory, according to the Ratzeburg register; (2) places expressly marked or implicitly denoted Slavonic, according to documents reaching to 1400; (3) places in which Slavonic family names are very prominent, a notable feature, or of occasional occurrence, according to documents dating from 1401–1600.

The First Use of the Name "Maelstrom."—In a note on this subject in vol. 23, p. 384, it was stated that the earliest use of the name "Maelstrom" seemed to occur in Mercator's atlas of 1595, the older term "Muskoestrom" having been used

in previous maps. A still earlier use, however, is that in Waghenaer's nautical atlas of 1584–85 (*cf.* February number, p. 204), the individual map in which the term is found bearing the date 1583. This is, therefore, earlier than the occurrence in Hakluyt (1589) of the corrupted form "Malestrand," though the journey of Anthony Jenkinson, which is there described, was made in 1557. As Waghenaer was himself Dutch, the probable Dutch origin of the word still holds good.

ASIA.

Surveys in Ceylon.—The report of the Surveyor-General for 1904 shows that the total area covered by block surveys amounts since 1897 to 525,616 acres, the total area so surveyed in 1904 being 198,383 acres. Since the commencement of the work 2600½ square miles have been covered by the field staff, and 912½ square miles issued as preliminary plans for settlement purposes. During 1904 the first serious attack on the mountain zone was made by two parties, one continuing the "1-mile-to-an-inch survey," the other starting the plane-table "contour" surveys. The entire topographic survey staff was engaged in the Province of Uva, the "1-mile" section taking up the country in the north from the work already mapped. The continuation of the "1-mile" survey, carried out in 1904 by only eight surveyors, will expedite the publication of the 4-mile wall map, the present one being obsolete and very inaccurate, while the data supplied will also expedite the contour survey. A map of Ceylon, 16 miles to an inch, shows the principal and minor roads, cart tracks, railways, respective areas of topographic and block surveys, 1897 1901, as also the area under survey in 1905. Included in the interesting report are an exact reproduction from the 4-mile-to-an-inch map now available and another map, placed beside it for comparison, being a reduction to the same scale of the same area, as a result of the new survey. The new map includes bridle and foot paths, paddy-fields, estates, and gardens. There is shown a plane-table survey map, eventually to cover the whole of the mountain area, on the scale of 16 chains to an inch, with a contour interval of 25 feet, as well as a 1-mile reduction of it; a work which will determine the altitudinal distribution of different products, and the location of proposed roads and railway routes.

AFRICA.

The Seychelles.—Mr. J. Stanley Gardiner has completed his series of papers on the results of the Indian ocean expedition, which have appeared from time to time in *Nature* and have been duly referred to in the *Journal*, by an account of the Seychelles archipelago, in the exploration of which he and Mr. Cooper spent seven weeks after finally leaving the *Sealark* (*Nature*, January 25, 1906). The archipelago rises from a submarine bank of fairly regular contour, measuring about 190 miles by 100, and bordered, chiefly in its north-west half, by a rim indicated by soundings shallower than the average depth of 30 fathoms occurring over the bank as a whole. In the north there are two typical surface reefs with coral islets, Bird and Dennis, in the neighbourhood of which the character of the bottom indicates the upgrowth of a rim. Between the two islands there seems a natural outfall for tidal and other currents, and both here and on the bank itself (across which strong currents also sweep) the sea seems always cloudy and unfavourable to the growth of reefs. The main islands of the western group, Mahé and Silhouette, reach heights of 2993 and 2467 feet respectively, while Praslin and the eastern group do not exceed 1270. All the islands are formed of coarse granites (or granulitic quartzes) with dykes of finer-grained black rock along which the mountain streams have invariably cut their courses. In places there is evidence of a recent elevation of more than 30 feet, masses of coral rock being found cemented on to the granite. There are also indications, particularly in Mahé,

of an elevation of over 200 feet, and the continuous precipices on the eastern or windward side of Mahé may be due to previous marine action, while in any case the extensive erosion and weathering argue a considerable antiquity for the land. Barrier reefs are entirely wanting, and fringing reefs occur sparingly, the reason seeming to be the almost complete absence of nullipores, so necessary for the consolidation of corals into true reefs. Where fringing flats do occur they appear to have a granitic basis, while their surfaces are covered with a far greater variety of large seaweeds than were found in any of the purely coral groups. The boat passages through them are generally mere outfalls for the tide, and have no connection with the land-streams. Cultural operations have largely destroyed the indigenous jungle, which, where it remains, is a typical moist tropical forest, with, however, few climbing plants or herbaceous dicotyledons, while nearly all the larger trees are peculiar Seychelles species, or even genera. The cotyledonous plants are sharply distinguished into three classes—the calciphilous, the siliciphilous, and the indiferents, the last being the least abundant. The calciphilous species were found to be practically the same as those of all the coral islands visited, and appear to be ocean-carried, the Seychelles being in this respect as oceanic as any of the Chagos islands. The seeds of many of the trees could also have been brought by currents, etc. An examination of a number of the nuts of the coco-de-mer showed that they are of two structurally different forms growing in about equal proportions on the same tree. The species of land and fresh-water animals are singularly few, and the former connection of the group with any larger land-mass seems doubtful. It is, however, the continuation of a broken line extending north from Madagascar, and its rock would seem to be similar to that of the great central plateau of the latter. The soundings made on the return voyage of the *Sealark* have confirmed the complete separation of the 2000-fathom lines of the Chagos, Maldive, and Seychelles groups.

French African Territories.—By a decree dated February 15, 1906, but previously made public and printed in the *Dépêche Coloniale* for February 13, the organization of the French Congo territory has once more received modifications (cf. *Journal*, vol. **23**, p. 523). These do not greatly affect the territorial subdivision of the area, which continues to be formed of four "circonscriptions"—those of the Gabun, the middle Congo, Ubangi-Shari, and the Chad territory, which embraces practically all the French portion of the Shari basin, together with Wadai and Kanem. The Gabun, however, receives some accession of area by the incorporation of some of the coast districts which previously belonged to the middle Congo, and it now comprises all the basin of the Ogowe, with coast districts from the Spanish territory in the north to Sette Cama in the south. The third and fourth "circonscriptions" (now formed into a single "colony") retain their old limits, but are placed under the general control of a lieut.-governor, residing at Fort-de-Possel; while the Chad territory is under the immediate control of a military commandant. A map showing the territorial limits is given in the *Dépêche* for February 14. The Algerian Sahara has likewise been reorganized, by a decree of August 14, 1905, as explained in the *Revue de Géographie* for December (with map). That decree fixed the limits of the four territories of Tuggurt, Ghardaia, Ain-Sefra, and the "Saharan Oases;" the first three occupying the more northern parts of the territory in a line from east to west, while the last, with Adghar as chief centre, extends south towards the frontier with French West Africa, which is shown on the map referred to. From the neighbourhood of Ghat, in Tripoli, it makes a sweep to the south (beyond 20° N.), so as to include most of the country covered by Colonel Laperrine's route of 1904 (*Journal*, vol. **24**, p. 348; vol. **27**, p. 87), afterwards running west-north-west and passing north of Taudeni.

The Duke of the Abruzzi's Expedition to Ruwenzori.—This expeditior sails from Naples on April 16. It consists of twelve Europeans: H.R.H. the Duke, Captain Cagni, Dr. Cavalli, Lieut. Winspeare, Dr. Roncati, a geologist, Signor Vittorio Sella, two alpine guides, two porters, an assistant photographer, and a cook.

AMERICA.

The South American Earthquake.—One of the destructive earthquakes which occur from time to time in the central zone of the New World, took place on January 31 last, the scene of most intense action being the western coast of Colombia and neighbouring portions of Ecuador. The details which have been published in the daily papers are not so complete as might be wished, but according to a Reuter telegram, despatched from New York on February 16, the first shock was felt in the province of Esmeraldas, Ecuador, at 10 a.m. on January 31, the disturbance continuing with short intervals until February 6, the inhabitants meanwhile living in a state of panic, and abandoning their houses for the open air. In the city of Esmeraldas various buildings collapsed, and much damage was done by a tidal wave, which inundated the principal streets, the people fleeing for the mountains. Near Port Limones four small islands are said to have disappeared, though not so suddenly as to prevent the fishermen who inhabited them from escaping in their boats. Other parts of the province shared in the devastation, which made itself felt in many Colombian towns, the damage and loss of life being apparently greatest at Mosquera, San Juan, and Domingo Ortiz, while Antioquia and other departments suffered heavily. Prof. J. Milne informs us that he obtained an excellent series of seismograms at his observatory at Shide, indicating an unusually large collapse. The instruments recorded the commencement of the disturbance at $3^h\ 47^m$ p.m. G.M.T., on January 31, the corresponding Colombian time being about $10^h\ 9^m$ a.m. One hour and fifty minutes later the large waves had reached their antipodes, disturbing on their route every seismograph constructed to record teleseismic movement, every spirit-level, agitating many magnetic needles, and producing a variety of effects only to be explained as the results of the South American convulsion. In the epifocal area islands sank and great sea-waves were created, while in Columbia the volcano of Cumbal was shaken into activity, and on February 16 severe shocks were experienced in the Antilles, walls being cracked and a cable interrupted. Prof. Milne points out that in the history of seismic disturbance in this region it is remarkable how often convulsions in the Cordillera have found a response in the West Indies. To go no further back than 1902, the great disaster at St. Pierre had been preceded by great disturbances in Guatemala. The record of cable fractures off the west coast of South America shows that the portion of the sea-floor off the mouth of the Esmeraldas river has been particularly liable to changes of contour. In his paper on "Sub-Oceanic Changes," printed in the *Journal* for August and September, 1897, Prof. Milne gave particulars of such changes, with a map (p. 264) showing the remarkable submarine gully which there exists, in the neighbourhood of which changes from 13 or 20 to upwards of 200 fathoms have taken place within a twelvemonth. In connection with the recent earthquake, it is of interest to note that the instruments at Shide recorded, on December 21, 1905, a striking series of disturbances by which the whole eastern side of Japan was shaken from north to south. The origin was beneath the Pacific ocean, and the first tremor reached Tokyo at $10^h\ 50^m\ 40^s$, or $1^h\ 50^m\ 40^s$ G.M.T. Quite recently the island of Formosa has also been shaken by a violent earthquake.

POLAR REGIONS.

Mr. Mikkelsen's Arctic Expedition.—Writing from New York on February 21, Mr. Mikkelsen announced that satisfactory progress had been made with the preparations for his expedition to the Beaufort sea (February number, p. 201). He had been fortunate in obtaining a generous grant of $3000 from the American Geographical Society, this being by far the largest grant ever made to an explorer by that body. The doubts as to the obtaining of a special ship for the purposes of the expedition are thus set at rest, and Mr. Mikkelsen had already had three or four offers of vessels, the most suitable being quite a new schooner, with auxiliary steam-power, which had been confiscated by the U.S. Government for unlawful fishing.

Danish Scientific Station in Greenland.—Early last year (*Journal*, vol. 25, p. 98) we alluded to the project set on foot by Mr. Morten P. Porsild for the establishment of a permanent scientific station in West Greenland. We are pleased to be able to state that the execution of this scheme is now secured, the cost of the foundation of such a station having been defrayed by a gift from Mr. A. Holck, a member of the Copenhagen bar, while the Danish Government has promised an annual grant of 10,000 kroner (£600) towards its maintenance. The place chosen is the south coast of Disco island, whither Mr. Porsild will proceed during the summer of the present year. A well-equipped laboratory, with a special view to biological work, will be attached to the station, and facilities will be given to visiting naturalists, foreign as well as Danish, who may wish to carry on research thereat, a small fee being charged for board only. It is hoped to establish a library of Arctic literature, which it is desired to make as complete as possible, and as the funds will not admit of large expenditure on purchases, the station must largely depend on the generosity of those interested in the matter to further the end in view by the presentation of suitable works, especially those dealing with Arctic biology.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Bottom Temperatures of Lakes.—The limnological work of recent years has frequently brought out the supposed fact that the bottom temperature is appreciably higher than that of intermediate layers. That this may—in some cases, at least—be only an apparent character is shown by Baron von Aufsess in a note in *Petermanns Mitteilungen* (1905, No. 11). Having found that the apparent rise in temperature may sometimes be explained as due to the increased pressure on the thermometer at greater depths, that observer lately carried out experiments with a specially constructed instrument, in which an ordinary minimum thermometer was enclosed in a stout glass tube, partially but not wholly filled with water before being sealed up. The water has the effect of accelerating the adjustment of the internal temperature to that of the water outside, while the air-space is necessary as a further safeguard against the influence of pressure at great depths. By taking a series of temperatures with this instrument and with an ordinary thermometer simultaneously, Baron von Aufsess found that at depths between 100 and 200 metres the difference might amount to as much as half a degree Centigrade (0·9° Fahr.), and that when allowance had been made for this, no general excess of temperature was observable in the bottom layer. Where such does exist (after the necessary correction), he is inclined to attribute it to local causes, such as springs, or to suppose that the position of the upper and lower observations may not exactly correspond, owing to the drifting of the boat. It does not seem possible to apply any constant correction on the score of the influence of pressure, and the use of some such appliance as has been described seems

necessary to avoid error, though care is needed to allow sufficient time for the equalization of the internal with the external temperature, which probably involves from twenty minutes to half an hour.

Early Knowledge of the Compass.—We have received from the author, Herr Heinrich Wehner, an interesting paper on the knowledge of the polarity of the magnetic needle in the early middle ages, forming Heft 11 of the *Vorträge und Abhandlungen* issued by the magazine *Das Weltall.* Herr Wehner bases his study on the orientation of sacred edifices in Europe during the period in question, a subject to which he has devoted his attention for some time, and on which he has now collected a large body of data, either by personal observation or by correspondence. The first part of the paper is taken up with a refutation of the idea, held by many, that in early days churches were laid down with their axes pointing to the quarter of the horizon in which the sun rose on the day of the saint to whom they were dedicated; and his case in regard to this point certainly seems a strong one. The supporters of the view alluded to have in many cases been forced to take the sun's azimuth at *setting* as determining the orientation, while the number of separate days in the calendar with which a given church might possibly be associated gives so much latitude that the value of the conclusions are considerably weakened. The author's own view is that the orientation was fixed by the use of the magnetic needle, not only from about 1500 onwards, for which period direct historical evidence is available, but during many centuries previously, the freemasonry of the building trade having prevented the properties of the needle from becoming generally known. The importance of this claim is evident from the fact that, were it substantiated, not only would our ideas as to the early knowledge of the compass be radically altered, but in the churches which have come down to us we should possess a hitherto hidden key to the magnetic variation in past centuries (in the case of churches the date of whose foundation is known), while at the same time a guide to the date of foundation of others would be forthcoming. Herr Wehner allows that further data must be collected before the question can be definitely settled, but he gives a large number of instances which certainly tell in favour of his view. He supplies for a number of German churches the observed azimuth of the axis side by side with the date of foundation, though he unfortunately does not make it quite clear to what extent the latter is vouched for by historical evidence, the exact date given being apparently deduced from the orientation in accordance with the general laws of the change of magnetic declination. But in any case it may be presumed that such dates agree, in a general way at least, with the historical data. The results of further research will be awaited with much interest.

The Third International Conference on Glaciers met last summer at Maloja in the upper Engadine, with a special view to discussing the relation between *névé*-stratification and the "banding" (*Bänderung*) observable in the glacier-snout, a subject which had been left open at the previous conferences of 1899 and 1901 (cf. *Journal*, vol. 16, p. 233). It was summoned by Prof. H. F. Reid, of Baltimore (who had made a special study of the question at the Forno glacier), and was attended by sixteen scientists, including Prof. E. J. Garwood, as representative of Great Britain. A short account of the proceedings was given by Professors Finsterwalder and Brückner in *Petermanns Mitteilungen* for November last (vol. 51, p. 256). In his opening addresses Prof. Reid expressed the belief that the view put forward sixty years before by Agassiz, that the banding is the direct outcome of the stratification of the *névé*, had been substantiated by his observations, and would, he hoped, be accepted by the conference. Two days (September 7 and 8) were devoted to an examination of the Forno glacier under

his guidance, and at the concluding meeting on the 9th, the members unanimously accepted Prof. Reid's views as embodied in a memorandum drawn up by Professors Brückner and Finsterwalder. In this the processes which seem to bring about the conversion of the *névé* stratification into the banding of the lower part of the glacier were fully set forth, and the conclusions with regard to certain other phenomena duly recorded. One of these was the behaviour of parasitic glaciers, of which a good example had been examined by the conference. In this case a small side glacier to the Forno glacier carried a parasitic glacier, while a third rested partly on each of the two first. It was found that, although the dividing surfaces were clearly evidenced by dirt-bands, there was no trace of sliding movement between the component glaciers, all three being evenly traversed by crevasses.

GENERAL.

Colonial Congress and Oceanographical Exhibition at Marseilles.—For some time past preparations have been in full swing for a French Colonial Congress, to be held at Marseilles in September next, under the presidency of M. J. Charles Roux, the well-known writer on colonial subjects. From the intimate connection which exists between marine and colonial affairs, it has been decided to extend the scope of the Congress by the addition of an exhibition, intended to illustrate all matters connected with the scientific study of the sea and its fisheries. Its organization was entrusted to M. Charles Bénard, president of the Oceanographical Society of the Golfe de Gascogne, who has done more than any one else to further the study of oceanography in France within recent years. In recognition of the fact that the sea knows no political boundaries, it was wisely decided to give the exhibition an international character, and the co-operation of the leading oceanographers of all nations was invited. A British committee was formed under the presidency of Sir John Murray, including representatives of the principal organizations connected with the study of oceanography and marine biology in this country, and under its auspices a representative British exhibit has been got together. The Society will be represented at Marseilles by Captain Wilson Barker, and, among other exhibits, has sent the model of the Antarctic exploring ship *Discovery*, a special feature of the exhibition being the illustration of the great scientific exploring expeditions. It will include—besides examples of the best scientific instruments and appliances, charts, photographs, etc.—a number of sections devoted to the industrial side of the subject: the equipment of fishing-vessels, appliances for the capture and preservation of fish, life-saving apparatus, and many other classes of objects. A congress of geographical societies and of the "Alliance française" (an association for the extension of the French language in the colonies and abroad) will also be arranged, the geographical section being under the presidency of M. le Myre de Vilers, president of the Paris Geographical Society. Its proceedings will be devoted towards furthering the spread and advancement of geographical science.

Honours for Captain Scott and Major Ryder.—The American Geographical Society has awarded its gold medal to Captain R. F. Scott, Commander of the National Antarctic Expedition; it will be presented by the American Ambassador at the meeting of the Society on April 9. The Paris Geographical Society has awarded a gold medal to Major C. H. D. Ryder, for his geographical work in connection with the Tibet Mission.

OBITUARY.

The Right Hon. Sir Hugh Muir Nelson, P.C., K.C.M.G.

The Queensland branch of the Royal Geographical Society of Australasia has suffered a severe loss by the death of its president, Sir Hugh Nelson, Lieut.-Governor and President of the Legislative Council of Queensland, which occurred at Toowoomba on New Year's Day. Our own Society also loses a distinguished member, Sir Hugh having been elected a Fellow in 1903. A son of the Rev. Dr. Nelson, who for many years played an honourable part in the life of the colony, Hugh Muir Nelson was born at Kilmarnock on December 31, 1835, and after being educated at the Edinburgh High School and Edinburgh University, emigrated with the rest of the family to Ipswich, near Brisbane, in 1853. As Queensland was not separated from New South Wales till 1859, his connection with the State in which he attained to such high office thus dated back to its earliest days as a distinctive colony. After a brief experience of business life at Ipswich, young Nelson turned his attention to farming, and for many years took an active part in the pastoral development of the Darling Downs region. It was not until he was nearly fifty years of age, in 1883, that he entered political life as a member of the Legislative Assembly, but from that time he rapidly rose from one position of public prominence to another. From 1858 to 1890 he acted as Secretary for Railways and Public Works, and in 1893 became Premier, Chief Secretary, and Treasurer of the Colony, a position he held with distinction during a period when the finances of Queensland needed particularly careful handling. Having been created a K.C.M.G. in 1896, and a member of the Privy Council in 1897, in which year he represented the colony in London at the Diamond Jubilee celebrations and received the honorary degree of D.C.L. from the University of Oxford, Sir Hugh Nelson resigned office in 1898 to become President of the Legislative Council. Five years later he was appointed Lieut-Governor of the State. His interest in geography is sufficiently indicated by his position at the head of the Queensland Society; in particular, he did a useful work in extending the activity of the Society in parts of the State outside of Brisbane.

CORRESPONDENCE.

Tanganyika or Tanganika.

Will you permit me, through the medium of your columns, to bring before the Fellows of the Royal Geographical Society the question of the orthography of the word "Tanganyika"? During my recent expedition to the lake, I am only conscious of having heard the name pronounced as is phonetically written Tanganika—that is to say, the *y* sound was conspicuously absent. I should like to urge, therefore, that in future the spelling Tanganika should be adopted.

Although the spelling most usual in this country is Tanganyika, the word is not infrequently written Tanganika in German and French publications, and the latter appears to be the spelling adopted by the government of Zanzibar. Stanley also, whose opinion is worthy of consideration, invariably wrote Tanganika, and considered the *y* to be superfluous. I might point out, too, that the spelling Tanganyika is the cause of not infrequent mispronunciation in this country, the name being pronounced as if it consisted of five syllables, instead of four.

If it be urged that it is undesirable to alter the spelling so widely used in the past, I would remark that the revised spelling differs so little from the old that it could not well cause any confusion. Again, I believe it is a fact that the spelling of other African place-names has been altered in comparatively recent years, in order to bring it into line with modern phonetic practice, such as Mombassa of the older writers, which is now officially spelled Mombasa.

W. A. CUNNINGTON.

Christ's College, Cambridge.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905–1906.

Eighth Meeting, February 26, 1906.—Colonel Sir THOMAS H. HOLDICH, K.C.M.G., K.C.I.E., C.B., R.E., Vice-President, in the Chair.

ELECTIONS:—*Lieut.-Colonel Campbell Anderson, D.S.O.; Emile A. Bruguière; William Leckie-Ewing; Richard Cope Morgan; Captain Alexander Greig Noble; Francis Reclam O'Neill; John Sanderson; Charles G. Seligmann, M.B.*

The paper read was:—

"Travels on the Boundaries of Bolivia and Peru." By Baron Erland Nordenskjöld.

Ninth Meeting, March 12, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

ELECTIONS:—*Señor D. A. Arauz; Ernest Way Elkington; H. Llewellyn Goodwin; William Kelway; Lieut. Chas. G. A. Lenny, R.N.; Wallace Foster Marsden; J. R. Southworth; Ernest Henry Wands.*

The paper read was:—

"Recent Journeys in the Rhodope Balkans." By Colonel F. R. Maunsell, C.M.G., R.A.

RESEARCH DEPARTMENT.

March 9, 1906.

"Geographical Distribution of the Alpine Race in Europe." By J. L. Myres.

Tenth Meeting, March 19, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., F.R.S., President, in the Chair.

ELECTIONS:—*H. Peters Bone; Wm. Charles Cooke; Stewart Spencer Davis; Sir Edward L. Durand, Bart.; Cressy Stephen Edmondson; Evan Dalton Griffiths; Joshua M. Hamilton; Colonel Sir Buchanan Scott, K.C.I.E., late R.E.*

The paper read was:—

"The Economic Geography of Australia." By Prof. J. W. Gregory, F.R.S.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Is. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Alps *M.K.K.G. Ges. Wien* **48** (1905): 561–570. **Wissert.**
Das Wangernitzenkar in der Schobergruppe Von A. Wissert. *With Map and Illustrations.*

Results of the sounding of two tarns at an elevation of some 8000 feet.

Austria—Herzegovina. **Daneš.**
Úvodı dolnı Neretvy. Geomorfologická studie. Napsal Dr. J. V Daneš. v Praze, 1905 Size 10 × 6½, pp 108 *Diagrams and Illustrations. Presented by the Author*

On the basin of the lower Narenta

Austria-Hungary. *Scottish G. Mag.* **22** (1906): 1–9. **Richardson.**
The Ethnology of Austria-Hungary. By R. Richardson. *With Map.*

France **Dubois and Guy.**
Album Géographique. Par M. Dubois et C. Guy. [Vol. **5.**] La France. Paris A. Colin, 1906. Size 11½ × 9, pp. xvi. and 241. *Illustrations. Price* 20 *fr.*

Completes the series begun some ten years ago. As in the previous parts, the pictures are well chosen, and present a vivid idea of the varied aspects of nature and human activity

France—Alps. *C. Rd.* **141** (1905): 754–757. **Helbronner.**
Sur les triangulations géodésiques complémentaires des hautes régions des Alpes françaises (troisième campaigne). Note de P. Helbronner.

France—Haute Marne. *Ann. G.* **13** (1904): 223–242, 310–321. **Bulard.**
L'industrie du fer dans la Haute-Marne. Par M. Bulard. *With Maps.*

France—Hérault. **Ferrasse.**
B.S. Languedoc. G. **27** (1904): 218–229; **28** (1905): 15–34, 205–221, 249–264.
Les Cavités naturelles du département de l'Hérault. Par E. Ferrasse. *With Plans.*

France—Historical. *Mém. A. Dijon* **9**, 1903–4 (1905): 67–175. **Oursel.**
Courtépée.- -Papillon. Voyages en Bourgogne. Publiés par C. Oursel.

Reprints of narratives of journeys made by Courtépée (the projector of the 'Description du duché de Bourgoyne') in 1757 and 1758, and by Papillon in 1722.

France—Nomenclature. *Ann. G.* **13** (1904): 207–222. **Gallois.**
La Weövre et la Haye: Étude de noms de pays. Par L. Gallois.

France—Ports. *Ann. G.* **13** (1904): 243–256, 322–333. **Léon.**
Les grands ports français de l'Atlantique. Par P. Léon.

France—Var. *C. Rd.* **141** (1905): 1053–1055. **Martel and de la Forest.**
Sur Fontaine-l'Évêque et les abîmes du Plan de Canjuers (Var). Note de E. A. Martel et Le Couppey de la Forest.

Germany—Bavaria. *Globus* **88** (1905): 357–362. **Jaeger.**
Der Tegernsee. Von J. Jaeger.

Germany—Oceanography. *Z. Ges. E. Berlin* (1905): 427–432. **Dinse.**
Die Studienfahrt des Instituts für Meereskunde nach Stettin, Swinemünde, Rügen und Bornholm. Von Dr. P. Dinse.

Greece—Athens. **Judeich.**
Topographie von Athen. Von Dr. Walther Judeich. (Handbuch klassischen Altertumswissenschaft herausgegeben von Dr. I. von Müller. 3 Bd., 2 Abt., 2 Teil.) München: C. H. Beck, 1905. Size 10 × 6½, pp. xii. and 416 *Plans. Price* 18*s.*

One of a series of handbooks dealing with classical antiquities. It gives a useful summary of our knowledge of ancient Athens

Greece—Geology. *C. Rd.* **141** (1905): 918 920. **Négris.**
Émersion crétacée en Grèce. Note de P. Négris.

Holland—Phenology. **Bos.**
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Greek Ideas of Vulcanism. By Dr. C. R. Eastman.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Historical. **Speight and Nance.**

Britain's Sea Story, B.C. 55—A.D. 1805. Being the Story of British Heroism in Voyaging and Sea-Fight from Alfred's Time to the Battle of Trafalgar With an Introduction tracing the development of the structure of Sailing Ships from the earliest times. Edited by E. E. Speight and R. Morton Nance. London: Hodder & Stoughton, 1906. Size $7\frac{1}{2} \times 5$, pp. xii. and 428. *Illustrations. Price 2s. 6d. net. Presented by the Publishers.*

A valuable addition to school literature, as no reader dealing in precisely the same way with the British maritime history has hitherto been available. The descriptions of famous exploits are mostly in the words of recognized authorities, and the illustrations may be trusted to give an accurate representation (so far as is possible) of the ships of former times, of which subject Mr. Nance has long made a special study.

BIOGRAPHY.

Dombey. **Hamy.**

Joseph Dombey, Médicin, Naturaliste, Archéologue. Explorateur du Pérou, du Chili et du Brésil (1778-1785) Sa vie, son œuvre, sa correspondance. Par le Dr E. T. Hamy. Paris: E. Guilmoto, 1905 Size $9 \times 5\frac{1}{2}$, pp. cviii. and 484. *Map and Illustrations. Price 5s. 8d.*

This traveller, whose special branch of study was botany, received his commission to explore the natural productions of Peru from the French minister, Turgot.

GENERAL.

Sailing-craft. **Smyth.**

Mast and Sail in Europe and Asia. By H. Warington Smyth. London. John Murray, 1906. Size $9\frac{1}{2} \times 6$, pp. xx and 448 *Illustrations. Price 21s. net. Presented by the Publisher.*

A most interesting account of a great variety of sailing vessels, with most of which the author has gained personal acquaintance during his wide travels, and which are admirably illustrated from his own sketches. The work does not pretend to be an exhaustive treatise on the rig of sailing-craft, but supplies numberless details which could not be included in a more comprehensive work The arrangement is geographical.

Ski-running. **Somerville, Rickmers, and Richardson**

Ski-running. By D. M. M. Crichton Somerville, W. R Rickmers, and E. C. Richardson. Edited by E. C. Richardson. 2nd edit London: H. Cox, 1905. Size 9×6, pp. iv. and 116. *Illustrations. Presented by D. M. M. Crichton Somerville, Esq.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Belgium. **Institut Cartographique Militaire, Brussels.**

Carte Topographique de la Belgique. Scale 1 : 40,000 or 1·6 inch to a stat. mile. Sheets: 34, Tongres, 1905; 35, Gemmenich, 1904; 40, Wavre, 1904; 43, Limbourg, 1905; 47, Namur, 1905; 59, St. Hubert, 1904; 61, Limerlé, 1904. Brussels: Institut Cartographique Militaire. *Price 3 fr. each sheet.*

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from February 1 to 28, 1906.

1 inch—(third edition):—

In outline, 85, 242, 1s. *each* (engraved).

Printed in colours, folded in cover or flat in sheets, 234. *Price, on paper, 1s.; mounted on linen, 1s. 6d. each.*

6-inch—County Maps (first revision):—

Devonshire (1a S.E. and 1 S.W.), 16 S.E., 20 N.E., 31 N.E., 33 N.E., 35 S.W., 43 N.W., 45 S.W., 46 N.E., S.W., 55 S.E., 57 N.W., 59 N.W., 67 N.E., 70 S.W., 71 N.W., N.E., S.W.,

S.E., 79 N.W., N.E., 81 N.E., 82 N.W., N.E. **Lincolnshire**, 105 S.W., 116 N.W., 117 N.W., N.E., 147 N.W. **Norfolk**, 95 N.W., 97 N.W., S.E. **Somerset**, 68 S.E. **Warwickshire**, 41 S.W. **Worcestershire and ditto** (Det. No. 7), 25 N.E., 46 S.E., 48 S.W., 63 S.W. ***Yorkshire*** *(First Revision of 1891 Survey), 288 S.W. 1s. each.*

25-inch—County Maps (first revision):—

Cardiganshire, XXXIX. 14, 15; XLV. 2. **Carmarthenshire**, V. 14; VIII. 15, 16; XIII. 2, 7, 12; XV. 16; XVI. 1, 3, 5, 7, 8, 13, 14, 16; XVII. 1, 5, 13, 15; XVIII. 14, 15. **Devonshire**, XLI. 2, 7, 8, 11; LII. 2, 3, 4, 6, 7, 11; LIII. 1; CXVI. 1, (2 and 3), 5, 6, 9, 10, 11, 13, 15; CXIX. 5; CXX. 9; CXXII. 1, 2, (3 and 4), 5, 9, 13, 14, 15; CXXVI. 11; CXXVIII. 1, 2, 3, 5, 6, 7, 9, 10, 13, 14; CXXXIV. 2. **Lincolnshire**, LXIX. 3, 4, 7; LXXI. 3, 5, 6, 8, 9, 10, 13, 14; LXXII. 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; LXXIII. 2, 3, 5, 6, 13; LXXXIV. 7, 9, 11, 13, (15 and 16). **Norfolk**, III. 14, 15, 16; VIII. 2, 3, 4, 7, 8, 9, 12, 13, 14, 15, 16; IX. 11; XVI. 16; XVII. 1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15; XXI. 14; XXV. 4, 8, 12; XXVI. 1, 2, 3, 5, 6, 9, 10; XXXI. 12; XXXII. 2, 3, 5, 6, 7, 9, 10, 13; XLIII. 11, 15; XLVIII. 15; LV. 7; LVI. 9, 13; LXVII. 8, 12, 16; LXVIII. 1, 9, 13; LXXIX. 4, 8, 12; LXXX. 9, 14, 15, 16. **Warwickshire**, XXII. 13. **Yorkshire** (First Revision of 1891 Survey), CCLXXIII. 7; CCLXXIV. 2, 5, 8, 9, 10; CCLXXV. 5, 6, 7, 8, 10, 13, 15. *3s. each.*

(*E. Stanford, London Agent.*)

Germany. **K. Preussische Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartographischen Abteilungen der K. Preussische Landesaufnahme. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile Sheets: (plain) 339, Dessau; (brown hills and contours) 334, Höxter. Berlin: K. Preussische Landesaufnahme, 1905. *Price* 1.50 *mark each sheet.*

ASIA.

British North Borneo. **British North Borneo Company.**

A map of British North Borneo. Compiled from the English Admiralty Charts, and from the surveys and explorations of Messrs. F. X. Witti, W. B. Pryer, F. Hatton, Henry Walker, D. D. Daly, and R. D. Beeston, in the service of the British North Borneo Company. Scale 1 : 633,600 or 1 inch to 10 stat. miles. 2 Sheets. London: Edward Stanford, 1906. *Price 2s. 6d.*

By comparing this map with the edition published in 1903, it will be seen that a considerable amount of new geographical information has been obtained during the interval. This is specially the case with regard to the interior region bordering on the Dutch territory. A great deal of the country still remains unexplored, and much that is shown on the map is of a very approximate and sketchy nature.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 9 N.E., parts of district Sukkur, and and Khairpur State (Sind, Bombay Presidency), additions to 1901. 21 N.W., parts of district Thar and Parkar, and of States Palanpur and Palanpur Agency (Bombay Presidency), and of Jodhpur (Rajputana), 1905. 25 N.E., Island of Bombay, and parts of districts Kolaba, Poona, and Thana, and Bhor State (Bombay Presidency), 1905. 39 N.E., parts of districts Ahmednagar (Bombay Presidency), Bir and Usmanabad (Nizam's Dominions), additions to 1903. 39 S.E., parts of districts Sholapur, Ahmednagar, Poona, and Phaltan State (Bombay Presidency), and districts Naldurg and Bir (Nizam's Dominions), additions to 1905. 59 S.E., parts of districts Kolar, Tumkur, and Chitaldroog (Mysore), and of Anantapur and Cuddapah (Madras), 1905. 67 S.E., parts of districts Bareilly, Pilibhit, Shahjahanpur, and Kheri (United Provinces), and Nepal (Native State), additions to 1903. 69 S.E., parts of Districts Hanurpur, Fatehpur, and Banda (U.P. of Agra and Oudh), and State of Bundelkhand (C.I. Agency), additions to 1902. 71 N.W., parts of districts Narsinghpur, Saugor, Damoh, Hoshangabad (C.P.), and of Native State Bhopal, Gwalior, Nawab Basoda, and Muhammadgarh (C.I. Agency), additions to 1902. 130 S.E., parts of districts Naga Hills, Manipur State, and of Naga Tribes (Assam), additions to 1904. 109, part of district Vizagapatam (Madras Presidency), with additions to 1904. 112, parts of districts Darbhanga, Muzaffarpur, Patna, Gaya, Hazaribagh, Monghyr, Bhagalpur, Sonthal Parganas, Dinajpur, Malda, Murshidabad, and Purnea (Bengal), additions to 1903.—India and adjacent countries, scale 1 : 1,000,000. Sheet 86, parts of Burma and the Andaman Islands.—India, 1 inch to 256 miles, additions to 1904.—Punjab, North-Western Frontier, and Kashmir, 1 inch to 16 miles, 4 sheets, 1905.—Bombay, 1 inch to 4 miles; district Ahmedabad (Second Edition), 1905; district Poona, 1905.—

Bengal, 1 inch to 8 miles; district Tippera, 1903.—Lower Provinces, Bengal, 1 inch to 4 miles; district Dacca (Second Edition), 1904.—U.P. of Agra and Oudh, 1 inch to 4 miles; District Sultanpur, additions to 1905.—North-Western Trans-Frontier Survey, 1 inch to 2 miles. Sheet 437 (Second Provisional Edition), parts of Afghanistan and the Kurram Valley (N.W.F. Province), Seasons 1878–80, 1894–95, 1897–98, 1905.—Assam Survey, 1 inch to a mile. Sheet 7, part of District Goalpara, Season 1891–92, 1904.—Bombay Survey, 1 inch to a mile. Sheets: 111 (Second Edition), parts of district Ahmedabad and States of Vala, and Bhavnagar (Kathiawar Agency), and Baroda, Season 1868–69, additions to 1902; 250, parts of States Gwalior, Indore, and Jhabua (C.I. Agency), and of Panch Mahal's District (Bombay), Season 1879–80, additions to 1895.—Burma Survey, 1 inch to a mile. Sheet 115 (N.S.), parts of districts Sandoway, Thayetmyo, and Kyaukpyu, Seasons 1900–1902, 1905.—Central India and Rajputana Survey, 1 inch to a mile. Sheets: 212, parts of States Gwalior, Indore, and Jhabua (C.I. Agency), and of Panch Mahal's District (Bombay), Season 1879–80, additions to 1895; 214, parts of States Gwalior, Indore, Dhar, Rajpur Ali, Jhabua, and Jobat (C.I. Agency), Season 1875–76, additions to 1903; 215, parts of States Gwalior, Indore, Dhar, Rajpur Ali, and Barwani (C.I. Agency), Season 1875–76, additions to 1903; 239, parts of States Gwalior, Jaora, Indore, and Sitaman (C.I. Agency), and Partabgarh (Rajputana Agency), Seasons 1874–75, additions to 1903; 242, parts of States Gwalior, Dhar, Rutlam, and Sailana (C.I. Agency), Seasons 1878–80, additions to 1903; 243, parts of States Gwalior, Indore, Dhar, Rutlam, Sailana, and Jhabua (C.I. Agency), Season 1878–79, additions to 1903; 246, parts of States Gwalior, Indore, and Dhar (C.I. Agency), Season 1873–74, additions to 1903, 247, parts of States Gwalior, Indore, Dhar, and Barwani (C.I. Agency), Seasons 1872–74, additions to 1903; 271, 275, parts of States Gwalior, Indore, and Dewas (C.I. Agency), Season 1877–78, additions to 1903; 301, parts of States Gwalior, Indore, Khilchipur, Narsinghgarh, and Rajgarh (C.I. Agency), and Jhalawar (Rajputana Agency), Season 1875–76, additions to 1905; 302, parts of States Gwalior, Indore, Dewas, Rajgarh, and Narsinhgarh (C.I. Agency), Season 1875–76, additions to 1903; 304, parts of States Gwalior, Indore, Bhopal, Dhar, and Dewas (C.I. Agency), Season 1877–78, additions to 1904; 331, parts of States Gwalior, Indore, Bhopal, Rajgarh, Narsinghgarh, Dewas, and Dhar (C.I. Agency), Season 1877–78, additions to 1904; 375, parts of States Bhopal and Gwalior (C.I. Agency), Season 1872–73, additions to 1904.—Central Provinces Survey, 1 inch to a mile. Sheet 29, parts of Gwalior State (C.I. Agency), Saugor district (C.P.), and Jhansi district (U.P.), Seasons 1856–57, 1864–65, 1870–72, 1895–96, 1905.—Madras Survey, 1 inch to a mile. Sheets: 27, parts of districts Kadur and Shimoga (Mysore), Season 1881–82, additions to 1899; 45, parts of districts Chitaldroog, Kadur, and Shimoga (Mysore), Season 1880–81, additions to 1904.—Punjab Survey, 1 inch to a mile. Sheets 209, part of district Lahore (Rechna and Bari Doab), Season 1902–03, 1905; 212 (Second Edition), parts of districts Montgomery, Lahore, and Ferozepore (Bari Doab), Season 1900–02, 1905.—Sind Survey, 1 inch to 2 miles. Sheets: 79, 80, 97, and 98, parts of districts Sukkur and Upper Sind Frontier, Seasons 1892–93, 1900–03, 1905; 114, Khairpur State, Season 1901–02, 1905.—Sind Survey, 1 inch to a mile. Sheet 39, districts Sukkur, Larkhana, and Upper Sind Frontier, Seasons 1899–1901, 1904.—South-Western Asia, 1 inch to 8 miles. Sheet 72 (Third Edition), parts of Persia and Turkey, 1905.—Index to the Standard Sheets of the Bombay Presidency, additions to 1905.—Index to the Standard Sheets of Sind (Bombay Presidency), additions to 1904. *Presented by H.M. Secretary of State for India, through the India Office.*

Japan. **Landis.**

Mission Map of Japan. Compiled by H. M. Landis. Scale 1 : 1,250,000 or 1 inch to 19·7 stat. miles. Tokyo: Methodist Publishing House, 1904.

This map gives a great deal of information regarding Christian missions in Japan. It distinguishes towns where churches exist from those without churches; and by the symbol employed to represent the town, its relative size and the number of inhabitants is clearly indicated. Railways are shown in red, and active volcanoes are clearly distinguished from other peaks. In addition to the principal map, there are nine inset maps and plans.

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: (Gold Coast) 60-O, 60-P. London: Topographical Section, General Staff, War Office, 1906. *Price 1s. 6d. each sheet. Presented by the Director of Military Operations.*

Algeria. **Service Géographique de l'Armée, Paris.**

Carte topographique de l'Algérie. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheet 117, Mezloug. Paris: Service géographique de l'Armée, [1906]. *Price* 1.50 *fr. each sheet.*

Egypt. **Survey Department, Cairo.**

Topographical Map of Giza Province. Scale 1 : 10,000 or 6·8 inches to a stat. mile. Sheets: S.E., Nos. 2-4, 2-5, 2-6, 3-4, 3-5, 3-6, 4-5, 4-6, 4-7, 5-5, 5-6, 5-7, 6-5, 6-6, 6-7, 7-5, 7-6, 7-7, 8-5, 8-6, 8-7, 9-5, 9-6, 9-7. Cairo: Survey Department, 1905. *Presented by the Director-General, Survey Department, Cairo.*

German East Africa. **Sprigade and Moisel.**

Karte von Deutsch-Ostafrika. Begonnen unter Leitung von Dr. Richard Kiepert, fortgesetzt unter Leitung von Paul Sprigade und Max Moisel. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Sheets: D 1, Kunguë-Bucht; D 2, Karema. Berlin: Dietrich Reimer (Ernst Vohsen), 1905. *Presented by Herr Max Moisel.*

With the publication of these two sheets this excellent large-scale map of German East Africa is drawing near completion, only eight more being required to make up the thirty-five of which the map is to consist. Although the material of which it is constructed is often of an approximate nature, yet until a systematic survey is undertaken the map must be considered the chief authority on the geographical features of the region.

Kamerun. **Moisel.**

Der deutsche Logóne und seine Nachbargebiete. Auf Grundlage der bisher unveröffentlichten Aufnahmen bezw. astronomischen Ortsbestimmungen von Oberlt. v. Bülow (1902–1903), Oberlt. Dominik (1902-1903), Hptm. Glauning (1902–1904), Oberlt. Marquardsen, Lt Schultze, Lt. v. Stephani, Oberlt. Strumpell und Lt. Schipper (1903–1904) und des gesamten veroffentlichten materials konstruiert u. gezeichnet von M. Moisel. Scale 1 : 750,000 or 1 inch to 11·8 stat. miles With descriptive text. Sonderabdruck aus den *Mitteilungen aus den deutschen Schutzgebieten*, Band xviii., 1905, Heft. 3. Berlin, 1905. *Presented by Herr M. Moisel.*

This sheet includes the German possessions in West Africa immediately to the south of Lake Chad, and extends from 9° 20′ to 12° 10′ N lat., and from 13° 30′ to 17 40′ E. long. The river Shari forms the eastern boundary, and the river Lagone runs through the centre of the sheet. There is an inset plan of Dikoa in the north-east corner, and separate plans showing the Rabbeh palace at Dikoa as it was in May, 1903, and in May, 1904, after the rebuilding of the barracks.

The sheet is accompanied by letterpress by Herr Max Moisel, giving full particulars as to authorities consulted and material utilized in its construction.

Tunis. **Service Géographique de l'Armée, Paris**

Carte topographique de la Tunisie. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheet xvii. Zaouiet Medienn. Paris: Service Géographique de l'Armée. [1905] *Price* 1.50 *fr. each sheet.*

AMERICA.

Brazil—S. Paulo. **Commissao Geographica e Geologica de S. Paulo.**

Topographical Map of the State of Sao Paulo. Scale 1 : 100,000 or 1 inch to 1·5 stat. mile. Preliminary edition. Sheets: Atibaia, 1904; Barra de Santos, 1905; Botucatu, 1903; Campinas, 1904; Casa Branca, 1905; Guarehy, 1902; Jacarehy, 1903; Jahu, 1904; Jundiahy, 1905; Mogy-Mirim, 1905; Pindamonhangaba, 1905; Piracicaba, 1905; Pirassununga, 1905; Rio Claro, 1904; S. Carlos do Pinhal, 1903; S. Paulo, 1905; S. Pedro, 1903; Ytu, 1905. Sao Paulo: Commissao Geographica e Geologica. *Presented by the Geographical and Geological Commission of the State of Sao Paulo.*

Although only a preliminary issue, this is a very creditable specimen of a topographical map The relief is shown by brown contours at intervals of 25 meters, the hundred-metre curves being darker than the others. Rivers are in blue, and roads, railways, and lettering in black. The combined effect is a very clear and useful map, and it is to be hoped that other parts of Brazil may soon be as well surveyed and mapped. The general appearance of the map resembles the U.S. geological and geographical survey.

Canada. **Dept. of the Interior, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheet 116, Rainy Hills, revised to January 11, 1906. Ottawa: Department of the Interior,

Topographical Surveys Branch, 1906. *Presented by the Canadian Department of the Interior.*

Chile—Argentine Boundary. **Oficina de Limites, Santiago.**

Comision Chilena de Limites. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet, Coquimbo. Santiago: Oficina de Limites, [1905]. *Presented by the Oficina de Limites, Santiago.*

The important map of which this sheet forms part was noticed in the *Geographical Journal* for November, 1905. This sheet includes the region extending from 30° to 31° S. lat., and from 60° 40′ to 70° 20′ W. long.

United States **U.S. Geological Survey.**

Geologic Atlas of the United States. Scale 1 : 125,000 or 1 inch to 1·9 stat. mile. Folios · 107, Newcastle, Wyoming-South Dakota; 108, Edgemont, South Dakota-Nebraska; 109, Cottonwood Falls, Kansas; 110, Latrobe, Pennsylvania; 111, Globe, Arizona; 112, Bisbee, Arizona; 113, Huron, South Dakota, 114, De Smet, South Dakota; 115, Kittanning, Pennsylvania; 116, Asheville, North Carolina-Tennessee; 117, Casselton-Fargo, North Dakota-Minnesota; 118, Greeneville, Tennessee-North Carolina; 119, Fayetteville, Arkansas-Missouri; 120, Silverton, Colorado; 121, Waynesburg, Pennsylvania; 122, Tahlequah, Indian Territory-Arkansas; 123, Elders Ridge, Pennsylvania; 124, Mount Mitchell, North Carolina-Tennesse; 125, Rural Valley, Pennsylvania; 126, Bradshaw mountains, Arizona; 127, Sundance, Wyoming-South Dakota. Washington: Department of the Interior, U.S. Geological Survey, 1904–5. *Presented by the U.S. Geological Survey.*

GENERAL.

World. **Hopfner.**

Thermische Anomalien. Von Dr. F Hopfner. *Petermanns Mitteilungen*, Jahrgang 1906, Tafeln 3, 4, und 5. Gotha: Justus Perthes, 1906. *Presented by the Publisher.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during November and December, 1905. *Presented by the Hydrographer, Admiralty.*

No.	Inches.	
2598		The World :—Curves of equal magnetic variation, 1907. 4*s*.
3527 m	= 6·9	Scotland, west coast :—Rothesay bay and approaches. 3*s*.
3521 m	= 6·9	Scotland, west coast :—Ballachulish bay. 2*s*. 6*d*.
2071 m	= 6·9	Ireland, south coast :—Youghal harbour. 2*s*. 6*d*.
3557 m	= 2·9	Færoe islands. Syderö :—Vaag fiord. 1*s*. 6*d*.
3537 m	= 1·45	Norway :—Kongs fiord, Kiberg and approaches, Sylte fiord. 1*s* 6*d*.
3535 m	= 1·4	Norway :—Anchorages on the north coast. 1*s*. 6*d*.
3536 m	= 1·4	Norway, north coast. Anchorages on :—Skarsvag and approaches. Lebesby and approaches. Mehavn fiord, Honningsvaag anchorage, Finnkongkieilen Berlevaag anchorage, Vardö, Gamvik and approaches with Koi fiord, Bugö Havn. 2*s*.
2361 m	= 0·35	Sweden. Sheet III. :—Öland to Landsort 2*s*. 6*d*.
2116 m	= 0·6	Denmark :—Little Belt. (Plans :—Juelsminde harbour, Svendborg sound.) 4*s*.
3526 m	= 6·0	Newfoundland. Bay of Exploits :—Lewisport harbour. 1*s*. 6*d*.
3513 m	= 6·0	West Indies. Cuba :—Port Cabañas. 2*s*. 6*d*.
3533 m	= 6·0	West Indies. Puerto Rico :—Boqueron bay. 1*s*. 6*d*.
1982*a* m	= 0·8	South America, east coast :—River Paraná (from the Paraná Guaru to Ceibal). 2*s*. 6*d*
1982*b* m	= 0·72	South America, east coast :—River Paraná (from Ceibal to Paraná). 2*s*. 6*d*.
3558 m	= 0·8	South America, east coast :—River Paraná (from Parana to Caálayti sand). 2*s*.
3523 m	= {6·0, 4·0, 8·5}	British Columbia. Plans on the east coast of Vancouver island :—Oyster harbour, Dodd and False narrows, Dodd narrows. 3*s*.
2512 m	= 4·0	British Columbia. Vancouver island :—Approaches to Nanaimo harbour. 1*s*. 6*d*.
3517 m	= 6·0	British Columbia. Vancouver island :—Nanoose harbour and approach. 3*s*.

No.	Inches.	
3532 m	= $\begin{Bmatrix}2{\cdot}0\\7{\cdot}2\end{Bmatrix}$	Africa, west coast. Senegal:—Entrance to the river Kasamanze. Karabane anchorage. 1s. 6d.
3492 m	= 9·0	Red sea:—Sheik el Barghût. 2s. 6d.
3540 m	= 2·9	Persian gulf, Bahrein island:—Khor Kaliya. 2s
3555 m	= 4·7	Philippine islands, Negros island:—Danao river and approaches. 2s.
3545 m	= 4·8	Philippine islands:—Approaches to Port Sual and Cabalitian bay, 3s.
3542 m	= var.	Cochin China. Plans on the coast of Annam:—Kua Viet or Palmo river, Donghoi, Kua Li hoa, Kua Tung, Song hiang. Kua Rone. 1s 6d.
3522 m	= 2·3	China:—Yang tse kiang and its tributaries. 2s. 6d.
3480 m	= 4 15	China, east coast:—Shantung promontory to Nagasaki. 2s. 6d
3491 m	= 1·0	China, north-east:—Shitau bay to north-east promontory. 2s. 6d.
141 m	= 4·5	Japan. Kiusiu, north coast:—Yobuko ko and approaches. 2s.
3511 m	= 2·0	Japan. Kiusiu, north coast:—Fukuoka wan. 1s. 6d.
83 m	= 1·1	Japan, inland sea:—Gogo shima to Miyo shima, including Kurushima Kaikyo. 3s.
3546 m	= $\begin{Bmatrix}2{\cdot}0\\4{\cdot}0\end{Bmatrix}$	Kuril islands. Plans on the west coast of Yetorofu jima:—Rubetsu wan. Oito wan. Furebetsu anchorage. 2s.
3551 m	= $\begin{Bmatrix}5{\cdot}0\\1{\cdot}0\end{Bmatrix}$	Kuril islands. Plans on the west coast of Yetorofu jima:—Shana wan, Naibo wan 2s.
417		Denmark. Graa deep. Plan added.—Esbjerg harbour.
2859		West Indies. Plans on the south coast of San Domingo. Plan added:—Barahona harbour.
551		South America, east coast. New plan:—Port San Antonio.
2284		Sumatra, west coast. New plans:—Sidoh bay, Riau and Lehong bays, Silugui bay.
935		Eastern archipelago. New plans.—Kamajang and Bonerato anchorages.
2466		Eastern archipelago. Anchorages in Flores, etc. New plan:—Sungi Monasa road.
2196		Celebes, southern part. Plan added. Labuandata bay.
3468		China, north coast. Plans on the coast of Shantung. Plan added:—Wang-kia bay.
1022		Pacific, islands and anchorages in. New plan:—Macquarie island.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2598	Curves of equal magnetic variation, 1895.	Curves of equal magnetic variation	2598
2071	Youghal harbour.	New plan. Youghal harbour	2071
2361	Öland to Landsort.	New chart. Öland to Landsort	2361
2229	Entrance to Great and Little belts.	New chart. Little Belt	2116
2116	Great and Little belts		
410	Port Cabañas. Plan on this sheet.	New plan. Port Cabañas	3513
1982*a*	Paraná river. Sheet 1.	New plan. River Paraná. Sheet 1	1982*a*
1982*b*	Paraná river. Sheet 2.	New plan. River Paraná. Sheet 2	1982*b*
1982*c*	Paraná river. Sheet 3.	New plan. River Paraná. From Paraná to Caalayti sand.	3558
2512	Nanaimo harbour and Departure bay.	New plan. Approaches to Nanaimo harbour	2512
585	Nanoose harbour. Plan on this sheet.	New plan. Nanoose harbour and approach	3517
1109	Mersa Sheikh Barud. Plan on this sheet.	New plan. Sheik el Barghût	3492

No.		Cancelled by	No.
3288	Port Sual. Plan on this sheet.	New plan. Approaches to Port Sual and Cabalitian bay	3545
83	Channels between Misima Nada and Iyo Nada.	New chart. Gogo shima to Miyo shima, including Kuru shima Kaikyo	83
2405	Rubetsu bay. Plan on this chart.	New plans. Rubetsu wan. Furebetsu anchorage, etc.	3546
2405	Shana anchorage Plan on this chart.	New plans. Shana wan. Naibo wan	3551
1268	Furebetsu anchorage. Plan on this sheet.	New Plans. Rubetsu wan. Furebetsu anchorage, etc.	3546
1268	Naibo harbour. Plan on this sheet.	New plans. Shana wan. Naibo wan	3551

(*J. D. Potter, Agent.*)

Charts that have received Important Corrections.

No. 1188, The World:—Coal and Telegraph chart. 1951, England, west coast:—Liverpool bay. 1975, England, east coast:—River Thames, Kentish Knock to the West Swin. 1607, England, east coast:—River Thames, North Foreland to the Nore. 2052, England, east coast:—Harwich approaches. 2397*a*, Scotland:—North and east coasts. 2397*b*, Scotland:—North and east coasts, with Orkneys and Shetlands 117, Færoe islands. 2962, Arctic Russia:—North cape to Einsamkeit island. 2963, Siberia:—Gulf of Ob and gulf of Yenisei. 689, Spain:—Gibraltar harbour. 2608, France:—Approaches to Toulon. 1196, Mediterranean, Ægean sea:—Port of Volo. 1658, Ægean sea:—Suda bay and Khania 2996, Black sea:—Karkinitskago bay. 1749, South America, east coast:—Monte Video to Buenos Aires, etc. 2908, Africa:—Port Natal entrance. 1696, Eastern archipelago:—Lombok to Flores. 2376, China, east coast:—Harbours in Formosa. 2695, China, north-east coast:—Sheet iii., Tung liu to Hankau. 2650, Russian Tartary:—Strait of Tartary, etc. 3033, Pacific ocean:—New Hebrides islands and New Caledonia

Canada. **Department of Marine and Fisheries, Ottawa.**

River St. Lawrence Scale 1 : 12,000 or 5·3 inches to a stat. mile. Chart 2. Longue Pointe to Varennes, surveyed by E D. Lafleur, C.E., assisted by C. F. X. Chaloner, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1897. Chart 3, Ile à l'Aigle to Ile Marie, surveyed by E. D. Lafleur, C.E., assisted by C. F. X. Chaloner, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1897. Chart 5, Ile Bouchard to Ile St. Ours, surveyed by C. F. X. Chaloner, C.E., assisted by P. E. Parent, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1898. Chart 6, Ile St. Ours to Ile aux Foins, surveyed by C. F. X. Chaloner, C.E., assisted by P. E. Parent, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1898. Published under the orders of Honble. Raymond Préfontaine, Minister of Marine and Fisheries for Canada Ottawa: Department of Marine and Fisheries, 1905. *Presented by the Canadian Hydrographical Department.*

These charts are the results of the surveys of the St. Lawrence by Messrs. Lafleur, Chaloner, Bickerdike, Amos, Parent, and Corvie made during the years 1897 and 1898. Many soundings are given, and the charts are well drawn and clearly printed in colours. They form part of a series now being published by the Department of Marines and Fisheries of Canada.

Chile. **Chilian Hydrographic Office.**

Chilian Hydrographic Charts. Nos.: 115, Islas Guaitecas; 124, Autofagasta, Caleta Hornos, Caleta Coloso. Valparaiso: Oficina Hidrográfica, 1905. *Presented by the Chilian Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for March, 1906. London: Meteorological Office, 1906. *Price 6d. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for February, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Java. **Petrocokino.**

Thirty-eight photographs of Java, taken by A. Petrocokino, Esq. *Presented by A. Petrocokino, Esq.*

The views of temples, Buddhist carvings, and other antiquities are specially interesting. In addition to these, there are photographs of volcanoes and typical scenes in Java.

(1) Canalized river in Batavia; (2 and 3) View in the gardens, Buitenzorg; (4) Buitenzorg, Salak volcano in background; (5) Dutch official's house, Buitenzorg; (6) Racecourse with native stands, Bandoong; (7) A ruined temple at Brambanan; (8) View from Tosari; (9) On the road to Magelang; (10) Native village near Garoet; (11) Gede volcano from Sindanglaja; (12) Tjipanas, near Garoet; (13) Hills of sulphur in crater of Papandajan; (14) Interior of crater of Bromo, (15) Volcano of Batok in crater of Tengger; (16) In Soerabaja; (17) Dutch house in Soerabaja; (18) Street, Soerabaja; (19) Mouth of the crater of Bromo; (20) Kawi volcano from Tosari; (21) Hindu village near Tosari; (22) The crater of Papandajan; (23) The Dasar, crater of the Tengger; (24) Near Leles, showing Goentoer volcano; (25) Lake of Leles; (26) Dutch fort, Djokjakarta; (27) In the Kraton, Djokjakarta; (28 and 29) View from the Boro Boedor; (30) View through archway of Boro Boedor; (31) Domes on Boro Boedor; (32) Corner of terrace of Boro Boedor; (33) Bas reliefs of Boro Boedor; (34) Corner of basement of temple of Boro Boedor; (35) Tjandi Brambanan; (36) One of the figures at the ruined temple of Tjandi Sewoe; (37) View of ruined temple of Tjandi Sewoe; (38) Statue of Buddha in temple of Mendoet, near Djokjakarta.

Nigeria. **Howard.**

Fifty-five photographs of Nigeria, taken by Captain C. A. M. Howard (West India Regiment). *Presented by Captain C. A. M. Howard.*

These photographs were taken by Captain Howard between November, 1904, and September, 1905. They represent scenes on the Niger between the Forcados river mouth and the French frontier. The following are the titles:—

(1) Government wharf, Burutu; (2) Typical native village on the Forcados river; (3) Digali station; (4) Messrs. Holt's screw steam lighter *Trader* ashore; (5) Niger Company's s.w. *Kaduna*; (6) Mureji village; (7) Government rest-hulk *Africa* at Mureji; (8) Typical river-side village between Mureji and Jebba; (9) Approaching Ogudu; (10) Native canoes at Ogudu, (11) The landing-place at Jebba; (12) View on approaching Jebba; (13) The Niger above the Kissa gorge; (14) General view of Fort Goldie; (15) View down the Niger from Fort Goldie landing-place; (16) View across the river from Fort Goldie to Badjibo; (17) A typical scene on the departure of a Government officer, Fort Goldie; (18) The landing-place at Leaba West; (19) View down-stream from Leaba West; (20) Leaba East; (21) Approaching Wuru; (22) View down-stream from Wuru Portage; (23) View above the Wuru rapids; (24) Canoes ascending the Wuru rapids; (25) The Wuru rapids; (26) The Niger near Potashi; (27) View of the Niger, (28) Leaving the village of Lougungore; (29 and 30) Unloading at the Garafini portage; (31) View down the Niger from Garafini; (32) The big bend on the Malali rapids; (53) The river above the Malali rapids; (34) A street scene in Bussa; (35) The market place in Bussa; (36) The new cantonment, Bussa; (37) The doctor's house, Bussa; (38) The Niger at Ganakaiei; (39) Warra landing-place; (40) Canoes leaving Warra; (41) Native huts on Newmu island; (42) View up the Western river from Sagonu; (43) The Oku rapids; (44) Canoes ascending the Western river; (45) Canoe wrecked in Western river; (46) Gingima river; (47) Yelwa; (48) View in Yelwa market-place; (49) Traders stock caravans at Yelwa; (50) View from the old Government cantonments, Yelwa; (51) Inegu landing-place; (52) Sorogo landing-place; (53) View looking towards Illo; (54) The guard-room and entrance, Illo Fort; (55) The district officer's house at Illo Fort.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder, herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Dritte Reihe, Heft 6. Vegetationsbilder aus Kleinasien. Von Dr. Emerich Zederbauer. Jena: Gustav Fischer, 1906

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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EXPLORATION IN THE ABAI BASIN, ABYSSINIA.*

By H WELD BLUNDELL

In the spring of 1898, when camped at Mendi, in lat. 9° 50′, on the road between Adis Ababa and the Beni Shangul in the East Sudan, I discovered that the sharp bend of the Abai from the west to the north had been placed on the maps far too high. Travellers had observed the point where it is joined by the Dabus, and had then apparently judged its course, by the visible profile of distant mountains, to have lain almost due east and west, and the cartographers had joined this line in a graceful sweep to the last point where the river had been observed at Asendabo, a district some 130 miles to the east (at the bend from south to west). By theodolite observation, I fixed the bend of the elbow, which is also at the junction with the Didesa, from a station at Gumbi where it was visible, to be about 25 miles south of the point assigned to it in the maps The true course is not far, in fact, from the course assigned to a river marked as the Orghesa, which river may have been seen or heard of, but not recognized as the valley of the Nile. There is no such river, and it can therefore be expunged from the maps. I returned to England, having no time to make the necessary *détour*, owing to an intervening impassable country, and it was not till the spring of last year that I was able to return to the district. Taking Nejjo as a starting-point, I went by the Chochi range to the Abai valley to the point of the junction with the Didesa. In the mean time Mr. Crosby did good work along the Gojam side of the Abai, and, as far as could be done at the distance he was able to approach, gave the correct general course of the river. After spending the rainy season at Adis Ababa and the early winter in the Lake Suai district, I started

* Read at the Royal Geographical Society, December 4, 1905. Map, p. 656.

from the capital on January 4, 1905, to the north-west, to complete the survey of the Abai from the point of its westerly turn from south to west to the junction with the Didesa, *i.e.* roughly, from long. 37° 50′ to 35°.

Before starting to the Abai I made an expedition to Lake Suai, the northernmost of the chain of lakes that mark the rift-valley, or great depression, which starts from Lake Rudolf along the Hawash valley, to the south of the Great Plateau towards the Somali gulf. There are five islands in this Lake Suai, and the difficulty of getting to them under the conditions of a voyage of several hours in the dangerous cockle-shells of native rafts that only the amphibious inhabitants of the lake-shore could manipulate, lent some colour to the tradition that treasure and valuables had been deposited there during troublous times; the halo of romance had not been dissipated, and, in fact, had been rather enhanced by the mysterious hints of a certain journalist who had lately been there. As seems usual with the African lakes, the present sheet of water lies far below its original level. Two distinct terraces of former shores rise some 80 feet above the present level, forming a ring round that nearest to the lake on the north, about 4 miles from the shore, marking a former basin. A curious tradition, perhaps suggested by the apparent elevated shore, exists that at some far distant epoch what is now the lake was a kingdom 50 miles across, inhabited by seventy-eight chiefs, and that there was a tremendous cataclasm, accompanied by extraordinary noises; the territory with its population disappeared in a single night, and the lake and its islands made their appearance. The shores on the north side are fringed with a dense jungle of papyrus, out of the pithy stems of which the lake-dwellers, a tribe called Wattu, make their ingenious but very uncomfortable rafts. They are formed out of a single bunch bound in a solid round roll, and running to a fine point that is twisted up in the air and forms a high stem or cutwater; two other smaller bunches are tied to each side, forming a bulwark in the hollow of which the rower sits, and a certain amount of stability is obtained. They are fearfully crank, but quite unsinkable, as the pith stalks are as light and buoyant as corks.*

The voyage of two hours is not inviting when the wind blows strongly from the south. At this time of the year a strong wind springs up, blowing from this quarter up the lake, soon after sunrise, while swarms of hippos take their swims abroad in the night, and constantly charge upon the boats, so that the expedition has to be calculated to miss the encounter with hippos before sunrise and the wind before midday. Baron Erlanger's party, who had provided themselves with various patent inventions in the way of collapsible boats,

* The nearest approach to them are boats of Tasmania

spent two whole days and nights drifting about at the mercy of the winds, floating water-logged and helpless, so that they were near finishing their expedition as soon as it had begun, in a catastrophe. Not having any other resources, I availed myself of the native boats, *tanquas* as they are called, and had a prosperous though somewhat nervous voyage to the principal island Adicha, where the so called king of the islands lives.

There are five of these islands, called Adicha, Tulu Guddu, Fudoro, Debra Sina, and Galala; but Adicha is the most important as the

BOAT (TANQUA) USED ON LAKE SUAI.

royal seat and site of a very old church. On landing here a seedy-looking individual appeared at my tent-door. He wore a filthy shamma and a string of sheep's intestines wound round his head, a head-dress at once simple and effective. He led an equally seedy-looking sheep by a grass rope. Thinking this to be the usual durgo or present to a new-comer from his Majesty, I casually gave him a dollar, when I was informed, to my great embarrassment, that I had tipped the reigning sovereign. The story of the confirmation of his dignities, such as they are, was characteristic of the present Emperor Menelik. Some fifteen years ago, being in the neighbourhood to receive the submission of some rather turbulent Galla tribes in the neighbourhood, he questioned

the pretension of his Majesty of the islands to his title. The latter thereupon gave him his full pedigree, and satisfied the emperor of his claim to be fourteenth in descent from Ama Yasu, who was King of Abyssinia in 1682 1706.* The following are the names of his genealogical tree: Alibo (a name of a Galla village in Amorro) his father, Lipse Bartas, Waldo Maskal, Darkios, Bantu, Atto Kanafu, Gurgo, Ambasa, Wurka, Thoma, Enaro, Asko, Ama Yasu. He was reinstated in his position, and is now allowed an annual subsidy of food and clothes.

The boatmen and lake-shore dwellers are of the widely diffused tribe called Wattu, and are found round Lake Tsana and in Limmu and in the country north of Lake Rudolf. They are generally regarded by the Gallas and Amharas as an inferior, if not actually unclean race, owing to their being foul feeders, eating hippo, elephant, etc., a form of diet forbidden to the Amhara. Their language, of which I took a small vocabulary and examples, does not differ, beyond slight dialectic variations, from the eastern branch of Gallas and Guraghes.

The lake figures frequently in old chronicles, and especially in the wars of the Gran in the reign of Lebna Dengel, 1508 40, and Galawdewos (Claudius), 1540–50. There is an account of Abdel Kadar (in his history of the wars of Grau) that the Moslem leader camped on its shores, and wished to make boats to cross to the islands, given in this chronicle three in number, and having three churches each. Not even the enthusiasm of Islam was equal to the nervous strain of this sort of navigation. His followers stoutly refused, giving as a reason their want of provisions, and they finally persuaded the general to give up his boating expedition ('Futuh el Habesh,' p. 371: tran. R. Basset).

The islands were found to be useful places for banishment. Thus Baeda Maryam (1468–1478) punished an inconvenient prophet, Abba Mikael, head of the monks of Dabra Malago, for venturing to predict that the Amharic army would be defeated by the Moslems ('Perruchon Eskender,' pp. 31, 47). It was the scene, too, of a bloody battle between the Gallas under Robale, son of Mudana (who succeeded to Harmufa as luba, or priest-president of the Gallas confederacy), and Sartza Dengel, the Negus of Abyssinia (1563–1595). The king, according to a curious chronicle written by an Abyssinian monk of the time, "made a great slaughter and carried away much cattle," and the "Galla chief killed the Abyssinian general, Zara Johannis, and carried the war as far as Gojam after conquering Shoa." The same writer gives in his account some idea of this deadly secular struggle of Gallas and Christians, and the swaying north and south of the line of frontier with alternate

* He was buried in an island Mebraka of Tsana, his remains taken on a tanqua with great pomp ('Cronaca Abbrev.,' F Beguinot, p. 86)

Fac simile of part of a map entitled
DESCRICAÕ DO EMPERIO DE ÆTHIOPIA
Pello Pe Manoel Dalmeida da Compª de IESVS
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victory and defeat. He says the struggle reminded him of the proverb, "To-day to thee, to-morrow to another; victory given to me now, now to another; but there is one God who rules over all." * It must be always borne in mind that the Gallas gradually encroached up till their frontier reached to a line drawn across the west of Gojam along the centre of Shoa, and that it is within the last eighty years that the capital Adis Ababa was reconquered from them by the present emperor's grandfather, and only twenty-five years since the tribes among which my journey north to the Abai was to pass were finally subdued.

At the beginning of the year, January 4, 1905, I left Adis Ababa, and, ascending the southern slope of the plateau, camped on its edge to the north-west of the capital. The altitude of this extreme rim of the great circular basalt plateau which forms the highlands, or dagga, as it is called in Amharic, is about 8900 feet on its southern lip, slightly higher on the eastern, the latter being about 10,000 feet in elevation. The whole plateau is tilted to the west on a gradient of about 11 feet per mile. The actual level of the Nile bend is about 3000 feet.

Kitar and Wambera, which represent the top of the original basalt flow at the extreme western point near the Abai valley and at the edge of the Sudan plain, rise to a level of a little over 7300. Besides this general tilt of the whole plateau, there is a central depression roughly circular, to which the land from the external periphery slopes, giving the general conformation of a saucer with the centre cracked out, in which line of separation the Nile or Abai flows, while the radial fissures extending to the edge of the 3000–4000 feet thick plateau of volcanic rocks are utilized by the rivers which join the circular course of the Abai. The whole map would present the general figure of the spokes of a wheel running into the hub. In the middle of this hub, or circle (the province of Gojam), there is a lofty range, the highest altitude attained being over 12,000 feet by the T. Raba on the Talba Weha range. Where, however, these cracks or fissures in the great lava-mass "vergate" against or unfavourably to the watershed, there appear great chasms of absolutely perpendicular sides that suddenly yawn under the traveller's feet to lowlying, often fertile worlds 4000 to 5000 feet below.

The present seat of the king, and the new capital Adis Ababa, lies on the southern and more protected slope just below the extreme rim of the great plateau, having been removed there not more than twenty years ago (Adis Ababa means the "new flower"), owing to the destructive thunderstorms and hurricanes that the more exposed position of Entotto, the former capital, was subjected to The first day's journey to the north brings the traveller to the upper level some 8400 feet

* "Zenahu la Galla," edit. Schleicher, 'Geschicht d. Galla.'

above the sea. The general conformation of the tableland may be likened to the appearance presented by a section of trunk of a tree after a period of drying and seasoning; the cracks begin at the centre, and in drying take a radial direction to the circumference. The roads, therefore, largely follow, when possible, the high, almost level stretches of the plateau cut out by the ravines; for the cultivation, as well as the healthy climate, is characteristic of the original elevated surface, and is consequently the habitation of the "top dog," the conquering Amharic race, and their subject or agricultural fellahin, the Galla; while the under dog, the Shankala, Gonga, Gafat, etc., are driven into the Quorra, as it is called—the hot, feverish lower levels of the fissure valleys—where they struggle against the dense vegetation, bamboos, jungles, and generally undesirable conditions allotted to those who come off second best in the struggle for life.

The two main roads from Adis Ababa to the nearest point on the Abai, at Asendabo, pass one a little to the north-west of Fallé, and skirted by the great Mugr river gorge, which I followed, and the other, starting more to the west along the Mecha range, strikes nearly due north and joins the other in the Kutai district; and finally, crossing the Gudr river, ascends to the Asendabo Merawi plain to the ford below Kao. The first road passes through very fertile land, and is well cultivated, so far as the sparse population are able to do so, the great plain of Meta Robi and Chaffé Robi being specially adapted for grazing, though I saw besides some splendid fields of barley. There are two very deep and difficult fissures to cross, that of the river Urga or the Gundabrit valley, and that of the Gudr. The first is the steepest descent I ever saw in this country, the last part of the river being a slope of 52° and was practically a zigzag of steps in the face of the rock, and only mules loaded with the greatest dexterity and watched with the greatest care could come down as mine did without a single accident.

Nothing could be more typical of the surprising effects of the scenery produced by these great open chasms, where the water-erosion has done little to smooth away contours or work out talus from the original wall-like scarp. Scrambling from the bottom of the crack, 4000 feet deep and not 200 yards across, the traveller lands on a shelf representing the talus of erosion, and about half a mile in width, and then by another stiff climb emerges on to exactly the original level, and sees stretching before him a gently undulating plain covered with splendid timber, numerous villages, and all the characteristics of a cooler climate. Nothing could be more beautiful than the vegetation on these high levels from the Gundabrit valley to the west. The ground is undulating, and at well-arranged intervals for effect the giant long-leaved yew tree, *Podocarpus elongatus* ("Arz" in Tigrine), rears a lofty deep green tower to the height of over 100 feet above

the banks of juniper and jasmine laced with festoons of clematis that form the undergrowth, alternating with stretches of grass strewn with flowers of all the colours of the rainbow.

Without exception, it is the most beautiful country I have ever seen. The rank, festering vegetation that clings to hot and debilitating climates may produce wonderful effects both in pictures and to the imagination, but is never so really charming as the fresh, open growth that accompanies the cooler, invigorating air of high altitudes of 8000 feet within the tropics. At each level the same flora characteristics of that altitude reappear without fail. At about 4000 to 5000 feet, the giant gardenia (*Gardenia gigantica*) covers whole mountain-sides for miles; lower down, slightly, though often mingled with them, forests of the Protea, with its great opal white blossoms; while in Horro and beyond the whole landscape seemed to be a combination of the dense masses of mauve, shading off into delicate white, of the vernonia and tamarind on a background of the deep green masses of the giant cordia. An erythrina appears here in a new species, and is very effective with its bunches of deep red blossoms, set almost horizontally on the very extremity of the almost bare branches. It produces the curious artificial effect of branches of flowers attached to the points of an enormous broom. It reaches 40 feet or more. The native name is Gorech. The *E. tomentosa* was found by Heuglin in Gojam, but is markedly different.

The overcrowding of the trees and production of "jungle" are largely prevented by the burning of grass during the dry season, a process which, by destroying saplings and young trees, gives survivors room to grow into giants, and spaces thus kept free form open glades exactly adapted to produce the effect of well-laid-out grounds. Alas! the old story, "Every prospect pleases, and man alone is vile," is forced upon us once more. Everywhere lay abandoned houses and settlements given up by the industrious Galla owing to extortion and oppression of their overlords. "There would be much fruit and more tillage in the country if the great men did not ill-treat the people, and take what they have, so the latter do not choose to provide more than they require and is absolutely necessary." This was written in 1520 by Alvarez, the Portuguese envoy, and I have not a word to add.

It being impossible to follow the Abai from Asendabo, I had to make a *détour*, doubling the gorge at the point where the Finjar (Galla for "cataract") plunges from the Horro plateau 3000 feet into the valley below. The latitude was 9° 31′ 56″; that of Kao 9° 49′ 50″, which lies about north-east of it. The Finjar takes its rise in a great swamp or reed-choked lake of Chomen. Here a great battle was fought twenty-five years ago by Takla Haymanot, Negus of Gojam, against the Loya Gallas under Doro, their chief and general, in which the latter were defeated and his army decimated, the

fugitives flying into the swamp, where they perished in hundreds. These Loya are not mentioned in the Chronicles, but are among the list of six tribes of Gudru Gallas descendants of the fourth son of Orma—Luku, Loya, Serba, Amilu, Mallole, Andarsa (R. Basset, Notes to Chronicle; October, November, December, 1881, *Journal Asiat.*; Massaja, 'Lectiones Grammat.,' pp. 250, 251). They were probably a Gudru Galla offshoot, Gudru being one of the great original Galla tribes derived from Gudru, the descendant of Sapira, the progenitor of the Boran tribe of Gallas On the south of this swamp lies the great peak of Tulu Amara, and bounding it on the east lies the range of the Jimma mountains, Gombo being the name of the highest point. On the northern end, called Gulecha, rising to 9000 feet in height, is a large village and a custom house, the seat of the Shum. The lake is fed by several streams from the Jimma range, and Jarre, Kalecha, and others on the north. From this point the road leads pretty nearly due north towards the Abai. At Shirba fine timber of the Podocarpus makes its appearance again, and other flowering trees, as gardinia, dombeya, and *Buddlea polystachya*, standing out of a wealth of tall flowers, among which the heliotrope blossoms are conspicuous, and a vernonia, rising to such a height as to form great purple tunnels into which a caravan completely disappears.

From Jer Daga another slight *détour* has to be taken to come round again to the Abai at the Ford of Lokman, below Lokman market, at the head of a road from the south Lokemti; and about 4 miles east of the district of Dabis and 5 from Jer Daga, we cross a small river, the Angar, the divide between Horro and Amorro, and, passing the market of Deru, descend into the Lagamsa river valley, leaving Daga on the north, and reach the village of Lokman.

The next river valley to Lokman is that of the Gonga, the divide between Amorro and Jidda district. Gonga is the survival of the Gonga or Gonka race, whose vocabulary was collected by Dr. Beke (*J. Phil. Soc.*, April, 1845), a Shankala tribe, and probably allied, if not of the same race, as the better-known Shinash tribe, which gives its name in the lowlying quolla on each side of the Abai immediately on the west.* It must be borne in mind that these lowlying river-valleys and the partially level talus just above form the refuge of the original Shankala (*i.e.* slave) blacks, the conquering Gallas being on the higher and healthier grounds, thus again yielding the select sites to their rulers, the Abyssinians. Accordingly, the region here being

* The Gonga country, however, figured in Pero Paez maps as an important region, and probably the Sinach displaced the inhabitants as a representative of the race. There is a pretty full vocabulary given by Beke. The Gongas belong to the ground-race group, Kaffa being the other limb, separated by the intrusion of the Galla tribes. See also for the improved later map of P. Lobo, trans. Legrand, p. 222.

low, rocky, covered with jungle and bamboo, the names cease to be Galla, and are representative of the primitive ground races.

Turning north at Dukon Gorgis, we come on to a caravan route taking us to Wunchit, the edge of the plateau overlooking the Abai gorge and Sinacha, the name given to low levels on each side of the river, and the ford Molka Mabil. Sinacha, as it was pronounced to me (Dr. Beke, *ibid.*, says in Agawi it is Tzintzi), is Shinas and Shenash (Xenaxa, d'Abbadie, *ibid.*, pp. 61 and 181) of the Chronicles, and the Sinasse of d'Almeida, 'Histor. de Ethiopia a alta,' fol. 279; Tellez, 'Hist. Geral do Ethiopia a alta,' liv. iv. cap. iv. Beke, who came from the north as far as the Nile down the valley of the Jinjira river, describes the descent as "an excellent road, such as I have never met with in the Kolla (valley)," the descent being most gradual, winding gently down the sides of the mountains. He, however, wrongly conjectures that this was the main route in former days between the north and Enarya. It is mentioned in the 'Chron. Susenyos' (chap. 33. 226 and 39. 142), and its market Gusman or Guman, as on the road along the northern bank of the Abai east and west; but the road on the south side is difficult, and does not seem to offer such facilities as that at Lokman for passing to the south. F. Fernandez, in 1613, it is true, went this way, when passing from Gojam to Enarya (Narea). In Gojam the viceroy Cellaxos (*i.e.* Sala Kristos) at Ombrama (Wambaroma in Dr. Beke's map, just north of Sinacha) gave the Portuguese "some Gallas, some Shats, whom he sent for to act as guides to Narea over a road which traversed regions peopled for the most part by these two nations. Going west, after two or three days' journey across lands belonging to the Gonkas, they arrived at Sinasse (Sinacha), the principal town inhabited by the said Gonkas, who refused them an escort, which on behalf of the king they demanded for the rest of their journey to the Nile (Abai). The Gonkas refused and threatened violence, and the Portuguese were obliged to apply to the king for soldiers. In three days, with this escort, they arrived at Mine, at the place where they cross the Nile almost facing the land of Egypt, and west of its source. They crossed on rafts, as the river was in flood (early as it was, only the latter end of April), and went due south, the route to Narea being about 50 leagues. They were harassed by bandit Shats and Kaffirs, and next day crossed a small river Angar; and on the same day, changing the direction of the road, entered into a dense forest, descending a long and precipitous path to the banks of a large river, the Maleg. Surrounded by threatening Kaffirs, they crossed and reached next day the country of Narea, after ascending a mountain, Gauca, inhabited by an Abyssinian chief and a considerable following" (d'Almeida, lib. vii. chap. xiii.). In the map of Pero Paez, made very soon after, and probably founded on these accounts, Mine is put, in accordance with the narrative, in the bend of the Abai about

the junction of the Didesa. Going west, therefore, from Sinacha, Mino would be probably a ford in the Handak forest; the small river Angar would be crossed, and the Maleg* would be the Didesa, though the road does not correspond to any of the present roads from the Abai to Lekempti. The Shat country does not appear in P. Paez's map, but in Lobo's map, as between Enarea and the Didesa corresponding to the region of Limmu. The Shats seem to be a branch of the Gongas (*ibid.*, 2, fol. 338; cf. Guidi, 'Canzimi Ge'ezamariña,' 2, v. 33; C. Rossini, 'Di un nuovo codice d. Cr. Etiop.,' p. 18), who, according to d'Almeida, "lived in the most southern portions of Gojam, having come from their own land which was round about the Nile, and are great labourers and graziers" ('Chron. Abb.,' p. 39. Sartza Dengel died there, after eating fish at the river Gibbe).

The names of these provinces—Jidda, Chelia, and Evantu—are all represented by Galla eponyms in the earliest Genealogies of the Boran or second great division of Galla race, the first being the Baraytuma. Jidda figures as the son of Macha, the son of Dacha, the son of Sapira, the progenitor of the Boran Gallas. Of Jidda was born Hakako, whose firstborn was Gudru, and second Liban (south of Gudru on the maps). Of Daale, the brother of Jidda was born as third son, Obo—the Chelia Obo being probably a branch of this family, and frequently appearing in the wars of Susenyos (MSS., *ibid.* and Bòttego). Obo and Liban also appear as names of sons of Karayu, of the Baraytuma, but these seem, from their connection with Wollo, another of the sons given to Karayu, to belong to the eastern side of the Abyssinian plateau. The Wollo Gallas are now the most important of the Galla Muhammedan population.

Horro and Amorro do not appear in the early genealogy of the Zenahu Galla, but are given by Messaja ('Lect. Grammatical,' pp. 249–251) as two of the seven sons of Orma (their first reputed ancestor)—Borena, Tuloma, Liban, Gudru, Jimma, Nonno Horro, Amorro. Jimma lies to the south of Chomen, and Nonno further to the west and south of Gudru.

After crossing the Evantu mountain range, we again met the Abai on its southward sweep, and, following its direction, struck the Welmel tributary which divides Evantu from the Limmu range and district. The Welmel is the next most important affluent of the Abai since the Gudr, and drains the watershed north of Lekempti, and the water-parting on the west of which is the Didesa valley. At the point of crossing in lat. 10° 1′ the stream is 70 feet wide and 3 feet deep, running through a steep-sided channel at about $2\frac{1}{4}$ miles an hour. The

* D'Abbadie's servant had not heard of Maleg. I am inclined to think that Fernandez mistook the name "Melka," the Amharic word for "ford," for the name of the river.

name is duplicated in the south as a branch of the river in Arussi Galla-land (Bottego).

Tulu Weni is the highest point of the Limmu range, and is a conspicuous landmark visible from both Lekempti and Gulecha mentioned above, the northerly point of the Jimma range; it served as a most valuable point in the triangulation.

The descent from Adisa, the spur of the Limmu range, into the Handak forest is very steep, and the first camp was a drop from 7160 to 4050 feet, and from high, bracing, cool atmosphere to the thick jungle smothered in grass 10 to 12 feet high, a dense pall of smoke brooding over the sweltering valley, caused by the great tracts of burning grass and undergrowth. The vegetation, as usual, changes completely with the altitude. The principal tree was protea and some gardenias, but the blossoms of the former had shrivelled up in the fires, though they were in full array of their splendid bright green leaves, which come out just *before* the rains. The whole of this Didesa valley, like that of the Dabus, is scooped out to the gneiss and schistose formations below the basalt, and covered over a large portion with broken quartz. After three stifling days' march with very unwholesome water in rock clefts in the river Lugo's partially dried-up bed, we arrived on the fourth morning at the Melka Gombalé, an easy ford over the Nile about 13 miles east of its junction with the Didesa. The level of the bed is 2310 feet.

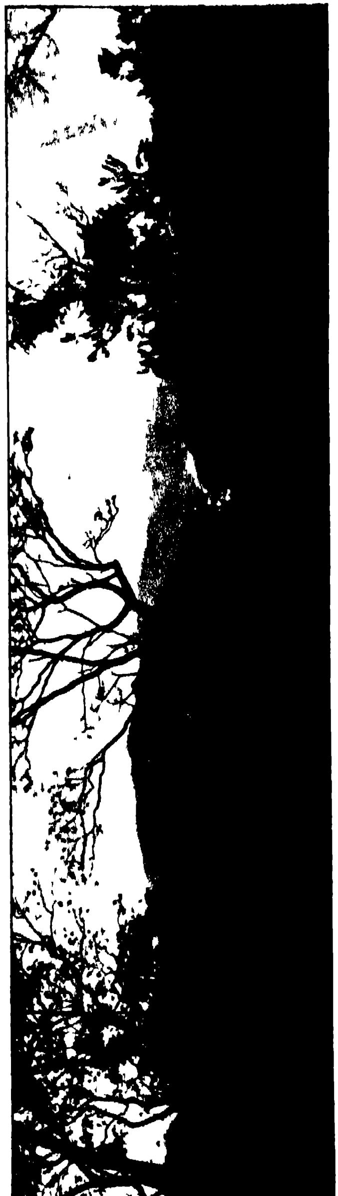
On crossing the Abai, we found ourselves abandoned by our guide and in a howling wilderness. A pioneer party sent ahead could make no guess at a possible road, and so I resigned myself to a passing native. From all appearance this seemed a very poor chance indeed in such an absolutely lonely region, but by good luck a Galla with a donkey and a pack of dry goods happened to be crossing to the Shum's house on Sarebanti, the lofty peak for which we had been steering far from the other side of the Handak. After making an extortionate bargain, we were steered up a rocky bed of a dried-up stream, over huge slippery boulders and deep holes, an appalling scramble on to a steep ridge, after which only the gradients made the road difficult. The short struggle was expensive; my horse sprained his shoulder badly though running loose, and a mule slipped off the side of a precipice and fell at least 40 feet, luckily into a dense jungle of shrubs that broke the fall and saved his bones.

The Abai, at this point striking away from the shoulder of the Limmu range at a spur called Endibo, is arrested in its further progress south, and, making a few bends round the base of Tulu Sarebanti across the Handak forest depression, receives the waters of the Didesa, and then turns about north to lat. 11°, in Sudan territory. The Didesa is the most important river that flows into the Abai except the combined Adabai and Wunchit, which join it in lat. 10° 2', before the great

river turns to the west. The discharge is one of enormous fluctuations. When I was there in April, 1904, at the point of the junction there was only one of the two channels in which water was flowing, and this measured about 110 yards across, and was not more than 3 feet deep. The other channel, separated by an island, was 125 yards across and perfectly dry, while the height of the flood measured by the high-water indications on the bank, would have represented a depth of over 5 feet in the middle section of this channel. This gives an idea of the futility of measurements. It is like trying to calculate the discharge at a tap without knowing when or how long the tap is turned on.

The name Didesa appears to be modern. I see no mention of it in any old accounts before 1861, when d'Abbadie was travelling in Western Shoa and made inquiries. Both he and his fellow-travellers, Massaja and others, seemed to have made an extraordinary error as to the distance of the Blue Nile, and were ready to believe that the Didesa was really that river; d'Abbadie generally shows an inclination to doubt the very few reliable native reports, and accept those that were most wildly inaccurate.

The Handak forest has always been famous as a favourite haunt for elephants. They seem to come up towards the



VIEW OVER THE ABAI AT THE JUNCTION WITH THE DIDESA

Nile by both the Didesa and Dabus rivers, attracted, no doubt, in the latter river-bed by the rich growth of young bamboo. North of the junction of the Didesa are the Naga Shankalas, the Handak or south side being only visited by hunters from the north for buffalo and antelope, hartebeast, and tetel. The Naga, d'Abbadie was informed, were not killed by the Gallas, as they paid tribute.

It is curious that this Naga tribe, hunters of elephant, and eaters of elephant flesh should bear the name of the old Ethiopic or Geez name for elephant, Nage. The modern Abyssinian name is Zehon, Tigre, Zehul; Somali Dogon. The kindred languages Afar and Saho have Dakano. On the north, in Bilin it is Jana; in Ghamir, Jan; in the south, in Kaffa, it is Dangiyo, Gonga, Dangaso; Wolamo and Warata, Dangarsa; Falasha, Jani. Only two languages in this group have an entirely different word—the Agau, Harmaj, and the Galla, Arba. We have in this word Jan a suggested explanation of the title given to the emperor, in ordinary usage, meaning "his Majesty," Jan Hoy. It is given by a passage in the chronicle of Mahdara Maryam. The King Sarza Dengel was engaged in a military expedition camped in Dambya, and was surprised to hear the inhabitants shout "Jan Hoy," which means "Hi! elephant," at an elephant which was destroying a field of corn, and fled when accosted with these objurgations. Then the king said that whenever he went to pillage corn, if the people cried "Jan Hoy!" he would consider their claims and redress their wrongs. From this arose the custom of addressing the king as Jan Hoy, as an equivalent for asking for justice, the expression gradually losing its special significance and becoming the ordinary term of address when speaking of his Majesty (Esteves Pereira, 'O Elephanto em Ethiopia,' p. 7). The earliest notice appears on an hieroglyphic inscription on the Stele of Pithom in the year 264 B.C., where it is mentioned, after founding a colony of Ptolemais Pheron at the end of the land of the Negroes, "the Egyptian admiral hunted many elephants."

In the inscription of Adulis, Ptolemy Euergetes (246–221 B.C.) declares he made war in Asia with a great army of soldiers, ships, and Ethiopic elephants. The 'Periplus, Maris Erythraei,' written about 67 A.D., mentions elephant-hunting in the neighbourhood of the Nile, and says the ivory was brought to Axum, and then to the port of Adulis. In the Geez inscriptions of Axum, which go back to the sixth century, mention is made of an elephant corps called Sarve Dakan, which, I think, shows that these elephants were Indian, and accounts for the Indian name in ancient Ethiopic.* The ivory trade seems to have been flourishing in the days of Cosmas Indicopleustes, who

* Cf Tigrine, *aha* = Sanscrit *ahi* ("cow"); *vide* Halevy, 'Rev. Semit.,' 1896, p 64

wrote about 545 A.D He says "the Ethiopians do not know how to domesticate their elephants, and if it happens that a king desires one for spectacular purposes, they catch small ones and train them. They export the tusks to Persia, Homeritida, and to the Roman Empire." In the present day the killing of an elephant is celebrated by festive dances and a traditional chant for the Goro Gadai, or the killer of the monster. The Gallas, in honour of the performance, shave their

ELEPHANT HUNTER ("GORO GADAI"), WITH THE TAIL AS A TROPHY.

heads, leaving a high tuft of hair in the middle,* just as they do after slaying an enemy, and after certain ceremonial rites (*vide* 'Zenahu la Galla Schleicher,' p. 27). The Abyssinians decorate themselves with a small earring. The hero is permitted to blow his own trumpet in a "war boast," called the "Fakar," an ancient, time-honoured custom (in

* This custom runs through most of South Arabia and Hebrew races in ancient days Warriors cut their hair and offer hair up at shrines of gods (*vide* Robertson Smith, 'Religion of Semites ' Wellhausen, 'Heidenthum,' p 161).

default of newspapers), both for servants, soldiers, and commanders at periods of festivities or military parade, for the purpose of calling attention to their deserts.

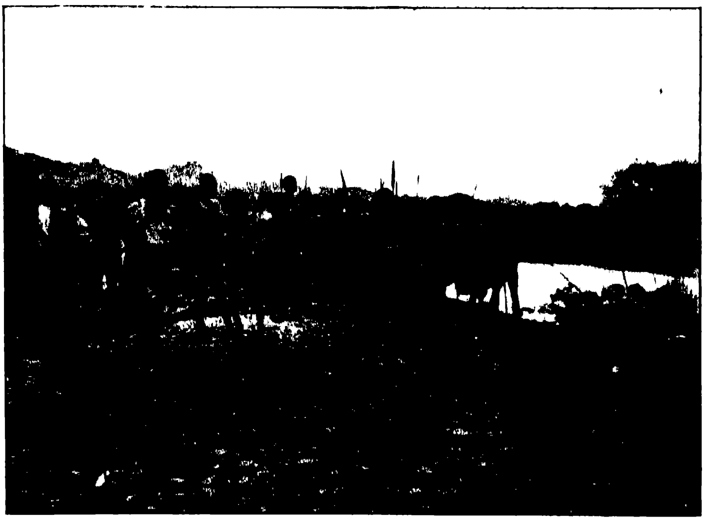
The Shankalas are mostly eaters of elephant, as well as hunters. For tracking they use a small sort of whippet with a fox-terrier shaped head—very clever and quick dogs. They are pourtrayed with perfect accuracy in the monuments of Thothmes at Thebes (*vide* 'Denkm,' iii. 31, *a*. 11; xii. 26).

At the junction of the Didesa the serious work of goldwashing begins, and continues along the Nile and down the course of the Dabus and its tributaries. The deep erosion of the upper strata of basalt and trap, and subsequent decomposition, lays bare the gneissic and hornblendic schist formations below, so that nearly the whole country from the foot of Chochi to the river, a distance of 15 miles, is covered with quartz pebbles and boulders, and shows numerous outcrops. The decomposed portions of the reefs are strewn over the ground, and the gold they contain is thus washed into the small streams, and then carried into the Abai. Gangs of Gallas from around Nejjo come in shifts, and I have met over a hundred at a time going down or coming up, laden with their simple paraphernalia: an oblong shallow dish, a sharpened stake, a flat curved scoop like a hockey-stick, a small gourd with a string to fasten over their head and hang behind their ears, for carrying the gold nuggets, and, lastly, a huge pipe called a "gaia" held like a Persian Kalian, made out of a gourd. Nejjo is the principal market, and the gold-quarter presents a lively and curious aspect. The stock-in-trade is a small neatly worked basket, containing pebbles ground to equal the weights required for weighing out the gold, a small copper balance, and finally, the gold-dust in quills The amount of gold exported from Nejjo has been put by engineers living there at about £80,000 a year, and the tribute of the king is about one-half of this. It is hard to apportion the amount to different localities, but, judging by report and the number of men employed, by far the largest quantity, probably about three-quarters, comes from the Dabus and the Beni Shangul rivers, the Tumat and its tributaries, while the district of the Nile-Didesa junction brings a certain quantity, as well as the immediate neighbourhood of Nejjo.

The Dabus, with its affluents, is worked by gold-washers for something like 40 miles of its course; but last season the greatest number of men—it was calculated over 2000 -were employed in the wider and slower-flowing reaches of the last 20 miles of its course to the Abai.

The history of this gold industry is not difficult to trace back to early days and some antiquity may be claimed for these workers' ancestors, seeing that alluvial gold is always easy to get, and could not have escaped the notice of natives in earliest times. The rings that are

made at Nejjo and the Beni Shangul are exactly those of the monuments of Osatirsen and Thothmes. Cosmas Indicopleustes describes how the king of the Axumites every other year through the Governor of Agau sends thither special agents to bargain for the gold. He then goes on to describe the same system of bargaining as that described by Herodotus. Not understanding the native language, they offered meat and various articles by leaving them on the ground and then retiring. In exchange for these the natives brought gold in nuggets like peas ($\theta\epsilon\rho\mu\alpha$ = lupines). After various attempts to adjust the price by adding or taking away the various articles till both parties were satisfied, the bargain was struck. He adds, "the sources of the



GALLA GOLDWASHERS ON THE DABUS.

Nile lie somewhere in these parts, and rain falls in torrents, and there are many snakes, and a multitude of rivers that all flow into the Nile." While describing the inscription at Axum, he makes the following Scolion on a region Sasu (Kasu, according to Dillmann): "The land of Sasu, where there is much gold that is known as Tancharas in the remotest parts of Ethiopia." This may be the tsogaira,* or gold rings, the name for a ring for the arm among the Shankala gold-washers at

* Dillmann (*K. Akad. z. Wissen.*, 1897) gives *adanguol* (Bilin) and *adangura* (Tigrine), meaning "a bone." But although they collect the dust in quills, they probably always melted the gold into rings for long transport There is a Gujerat and Sanscrit word, *tankara* = quarrier, or miner, which may afford the true explanation.

the present day. The Arab geographers are, as usual, very precise, but very confused. El Edrisi says, that on the Blue Nile there is a small town, Najagha; then it is six days to Marcata, and there is Jubaita (eight days further) in a desert, and here the people drink water from wells, and are given up to gold and silver mining. The mines are in Mount of Muris, four days from Jubaita. From the latter to Zeila is fourteen days. He says "the exports from the east coast of Somaliland were slaves and silver, and as to gold it is rare."

Another writer, Ibn Haukal, seems to have the mines now being developed in the direction of Suakin in his mind. Speaking of the Bajeh, situated between Habesh and Nubia, "where the inhabitants are blacker than Abyssinians, and where they have neither cities nor villages nor cultivated ground, there are gold-mines which extend from near the borders of Egypt to a certain castle on the east coast, which they call Assat (or Assab). Among these mines is a place called Allamy, situated on level ground. There are not in any quarter of the world such gold-mines as these." * As a specimen of geographical vagueness, I will give the following from El Hamadhani, who compiled a sort of Arabic Baedeker of the towns and countries of the Arab empire. He says, "Behind the country of Alwa (Aloa) there is a nation of blacks called Takina. They go naked, like the Zang (slaves). In this country gold grows or sprouts, and in their country the Nile forks, and they assert its rising is there, and behind the rising (the source of the Nile) there is darkness, and behind the darkness there is water in which gold grows, in the land of Takina and Ghana."

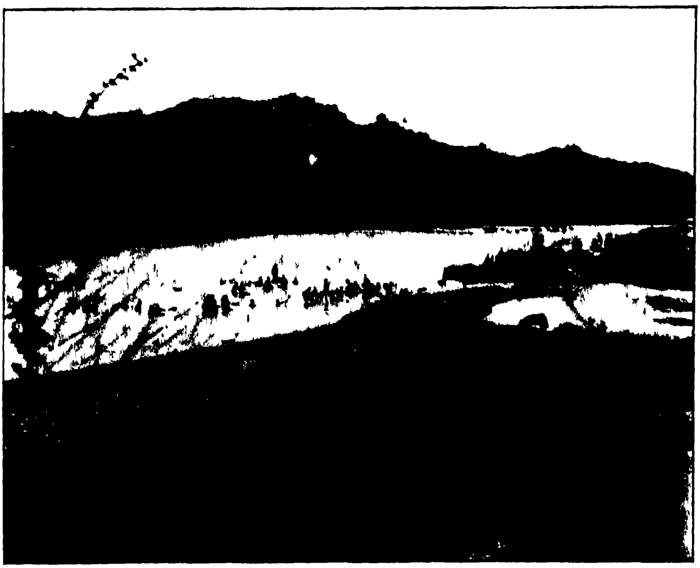
The Portuguese travellers, however, who first penetrated to the court of the Negus frequently mention the great amount of gold that was paid in tribute, especially from the country of Enarya. The Chronicles of the reign of Susenyos, for instance, are often concerned with expeditions to Wambora in the west towards the Fasay, and to Enarya in the south, to collect their gold tribute.

The Patriarch Bermudez, who said he travelled to the west along the Nile (about 1545), gives an amusing mixture of fact and fable in his description. He speaks of a country west of Damot, called Conche, which may be where a chief lived called Ash Gugce (perhaps Dejas, Guksa), Lord of Wealth. He took them across the large river (Didesa, apparently), and rightly describes the system of inflating leather sacks and skins, which they put under their necks to swim across. On the other side, where the land is barren and red (there are wide tracts of very

* Assab is the Aidhab of Ibn Batuta, and Allamy is the Allaké of Makrizi, between Abu Hammed and Suakin. Diodorus, quoting Agatharchides, gives an interesting account of the manner of working these mines, and full particulars of the system of boring and crushing ('Hist.,' vol. 3, c. 12, etc.; *vide* Wilkinson, *J.R.G.S.*, vol. 2, p. 17), by using children like chimney-sweeps to crawl into the shafts and pull out the quartz fragments.

deeply iron-impregnated soil), he says, "The soil contains two parts of gold to one of earth; this is what is obtained by melting, for which there are many artificers in the country, as many as there are blacksmiths here, and more, for gold is more common there than iron is here."

King Claudius, to verify the facts better, sent some of his men across. They went over and brought some of the earth, such as the others had brought, which, when melted down, yielded as much as the other. He also showed them across another river, a mountain which shone in places like the sun, evidently one of these great outcrops



GALLAS GOLDWASHING IN THE DABUS.

of quartz that are so frequent along the river-channels. The chief told the king that it was all gold, whereupon he was so delighted that he determined to make him a Christian. His reliability is somewhat discounted by the patriarch interlarding his account with equally solemn relations of griffins, "which are birds so large that they kill buffaloes and raise them in their claws as an eagle lifts a rabbit." "It is said," he goes on, "in certain precipitous and uninhabited mountains is born and lives the bird Phœnix, which is sole and alone in the world, and is one of the marvels of nature." Certainly if he ever saw a party of black giant hornbills stalking about and prodding in the soil, he might be forgiven for having his ignorance worked upon enough to

believe them "capable du tout." A grain, however, of unconscious information occasionally appears in the mass of ignorance, as when, for instance, he describes the gold that comes from the interior as having "points and shapes like some that comes from the Antilles" ("que o do serta tem pontas on area com o algum que vem das Antilhas"), which seems to indicate the pointed and spiculed nuggets that are found decomposed out of the pyrites and washed out into the small streams, specimens of which I have myself obtained in the Nejjo market.* A more reliable authority, Castanhoso, one of the dauntless body of 450 Portuguese who went under Gristoão da Gama to the assistance of King Claudius against the famous Grañ, or the left-handed, in 1541, tells us of the inducements the king held out to these Portuguese to remain in the country after the death and defeat of the Moslem enemy. The "preste," he says, "ordered the collection of all the chalices and crosses, and of all the silver from the churches, and of all the ornaments and bracelets of his mother, sister and relatives, and gave them to them, regretting much that he could give no more. He begged them not to go, for there was much gold in the country which he would give them; for far inland there were bestial Caffirs, who came in gangs on foot with much gold in bags at their sides to a fair in the back of his kingdom, which marches with these Caffres, which country is called Damot; that these negroes gave the gold in exchange for inferior and coarse Indian clothes and beads of red, blue, and green earth, which they valued highly, and gold very little; that if they would accompany him to that country they would conquer the mines, where they could glut themselves with gold." Bermudez makes out that he accompanied the king on this expedition, but the other Portuguese, to their honour, would not be tempted, saying that "they did not come to that country for any profit, only to serve God and the King our Lord."

The principal Galla tribe engaged in the gold industry are those of the Komo, a branch of the Gosa tribe dwelling at Nejjo and the surrounding districts. This Gosa Komo tribe extends to the Didesa river. Another branch of the Gosa are the Gosa Mao in Gojam, and Gosa Layo in the south and west of Nejjo, and Gosa Chemessi towards the Dabus. The name does not occur among the Chronicles, but they are probably a branch of the great Limmu group (D'Abbalie is informed (p. 174, *ibid.*) of the Komo and Mao tribes round Gulisa, a little south-west of Nejjo, but wrongly described as negroes), and extended north as the original Shankalas were dispossessed and dispersed. A type appears frequently among them closely approaching that described by the Portuguese of Enarea (P. D'Almeida, 'Hist. do Ethiop. o alta.,' chap. xiv.) as having

* Rusegger ('Reisen,' p. 311) describes the grains of gold in Tira, west of the White Nile The character of the gold grains in the more watered regions of East Sudan showed naturally a more rounded and leafy water-worn character.

fine lips and straight noses, without any characteristics of negroes. They probably spread north, attracted by the gold industry. Their old system of government, by the election of a priest king, called a Luba (formerly elected from each of the great septs or clans in rotation), seems to have gradually broken down before the steady pressure of the Abyssinian rule, and their ruler is now a Galla chief of the tribe, and received an Abyssinian official title of "Dejasmach." Not only this, but their primitive paganism is giving way to Abyssinian Christianity. The present chief, who began life as "Gumsa," was baptized with most of his followers and soldiers, and blossomed out into a

GALLA WOMEN (GOLDWASHERS).

Dejasmach Gabr Egsiabeher, or "servant of God," and the rest took Christian names of similar import. They still maintain, however, their system of an eight-year epoch or division of time, and the ceremonies of the butta (or eight-year period) still continue, though the power of the Luba within Abyssinian jurisdiction has been merged into that of officials appointed by the king. This Luba was described by Krapf ('Travels,' p. 76) thus: "He lets his hair float wildly, carries a bell in his hand, and a copper frontlet encircles his brow. 'Luva, cujus imperio Phylarchi parent sed nonnisi in bello. Primum ejus facinus est cogere plebem et Habessiniam irrumpere' (Ludolf, lib. i. c. 16).* He might, in fact, be regarded as a sort of

* Luba (or, as Ludof spells it through a native pronunciation, Luva) may be identified with the Hebrew Levi, לוי (لوان, lawān, of the South Arabian inscriptions) (Euting, 37, 49, and 55).

elected mad Mullah for declaring war and inciting to raid, and the curtailment of his power has not been any loss to the cause of peace and good government.

The following is an account of the election of a Luba as witnessed by one of the Italian engineers at Nejjo, Mr. Paradisi. The day is fixed as lucky according to divination by the Mora Ilaloha, or Haruspex, generally towards the end of September or October 1. Those who participate in the election, and chief performers, have to number five "butta," *i.e.* forty years of age, and at the time appointed meet by the river Alaltu (a name for rivers of frequent occurrence in Galla country). Each kills a bullock as a sacrificial victim in honour of their god Waq, and carries a piece of the hide on his head to the place of meeting, and all smear themselves with the blood, as well as a plentiful unction of butter. Traditional chants are sung, and the day ends in general orgy. The third year of the period the elected takes the name of Luboma, and all those who participated are circumcised. At the end of the term of eight years they again meet at the Alaltu river, and a man is elected, who, taking the name of Abba Gaffaddu (or the interrogator), puts him under an examination as to whether a father or mother or any of his family have died, if he has quarrelled or ill treated any of his neighbours, if he has been industrious, even if any animal of his has been ill or died of disease, and, finally, if any one has had to complain of his behaviour. The Luba elect then is presented with a spear and kills a bullock, and each person anoints his head with the blood, and a rush takes place to seize a piece of the hide, and every one who has got one distributes the bits to his friends and relations for luck. This hide ceremony reminds one of the part played by the skin of a victim in Arabia, Greece, and Rome. The skin of a victim was sacred, according to Herodotus, to the Libyans. A girdle of the skin was made into amulets for Arab children, and magical thongs were cut from the skin of the Piaculum by the Luperci at the Lupercalia games in ancient Rome (cp. dressing in hides, etc., at feast of Dionysos: Boissonade, 'Anec. Græca,' vol. 5). The smearing with blood is also universal among Semites—both as making the god participant and constituting blood brotherhood (*vide* R. Smith, *ibid.*, p. 321; Wellhausen, 'Heid.,' p. 125).

The higher lands round Mendi are the furthest extension in this direction of the Galla. We now descend into a hotter and lower country inhabited by the Shankalla or East Sudan races. The Berta used to be the principal tribe in these parts, but the Dervishes so completely wiped them out that the answer of the Arab guide to the question as to their whereabouts is the simple *ma fish* ("they don't exist"). The Beni Shongul who represent the Muhammedan vassals of a semi-Arab reigning family inhabit the hot unhealthy country between the Dabus and Famaka. Their principal defence, in fact,

against the blessings of Abyssinian rule lies in this—that no Abyssinian, if he can help it, will go into their country. My own muleteers, who were undefeated in endurance and toughness, all abandoned me at this point, and refused to move for any wages I could offer. They have a proverb, "The cut on a man's body is like a cut on the trunk of a tree," and in cases of cuts and wounds they are extraordinarily plucky, as well as healthy, as I can testify from my own experience of a man surviving my amateur surgery—sewing up a man's stomach from which his vitals were protruding, the result of a gash with a kitchen knife; but fever has an unholy terror for them, and they seem to offer very little resistance to an attack.

Before the paper, the PRESIDENT said: Just six years ago, Mr. Weld Blundell read a paper here, which some of you may remember, dealing with his travels during the previous eighteen months or two years in that country of Abyssinia, which must long remain one of the most interesting countries in the world. In that paper he described his journey from the Gulf of Aden to the valley of the Nile, and I dare say you will remember that he added largely to our geographical information (especially to our hydrographical information) about that region. He was accompanied on that journey by Dr. Koetlitz, who afterwards went as geologist with the Antarctic Expedition with Captain Scott, and who contributed a very excellent appendix, which also added largely to our knowledge. Since then Mr. Blundell has again been travelling in Abyssinia, and the geographical results of this journey we are going to hear to-night. You will understand that Mr. Blundell's travels have not been confined to Abyssinia; he has been a wanderer for many years. He has one defect—he is not one of those who publishes all he knows, but I hope later on he will give us more information than he has at present vouchsafed to us. I call upon him to read his paper.

After the paper, Sir THOMAS HOLDICH said: It is thirty-seven years since I made acquaintance with Abyssinia, and then the point of my acquaintance was very far removed from the scene of Mr. Weld Blundell's travels, for I was up in the north with an ever-memorable expedition. But it is somewhat interesting—it has been interesting to me, at any rate—to hear what Mr. Blundell has had to say about the general characteristics of Adis Ababa and Abyssinia. It reminds one what a vast country is really included in Abyssinia, the last, I believe, of the independent kingdoms in Africa. The expedition of 1868 started from the Red sea by a very rough and uneven way through a defile, until we reached the plateau at a point called Sanafé, which, I was pleased to see, was very well placed in that ancient Portuguese map. From there our track led us south along a remarkable watershed, constituting a very peculiar geographical feature. On the one side, one could look down over the tributaries of the Nile to an endless vista of hills rolling away westward; on the other side, a tumbled mass of spurs stretched to the flat plains which intervened between the plateau and the sea. It was my luck to be sent to find if there was any road from that plateau down to the sea-coast which would not involve our passing through that terrible defile. I succeeded in getting to the coast, but I never found that road, and I believe myself no such road exists. There is no road from the coast to the plateau between Sanafé and the latitude of Magdala. But whilst Mr. Blundell has described scenery which reminded me very much of what we saw in Abyssinia, I must confess the photographs did not remind me of it at all. In his series of pictures you have seen a country of rolling

hills stretching down to forest rivers, a country of lakes and streams. Now, what I remember is a country of perfectly flat-topped hills, escarped in a most extraordinary way so as to make them almost inaccessible. The plateau was a true level plain along which we passed, and, looking from it on either side, you saw smaller plateaus broken off as it were, set in the landscape in irregular formation as far as you could see. I did not see anything of that in the pictures to-night, but I believe the general characteristics of Southern Abyssinia to be much the same as they are in the north. You will remember, I dare say, that the fortress of Magdala was placed on top of just such a hill as I have described; and had it not been for the mistaken views of Emperor Theodore, who constructed a road in order to get one of his field-pieces to the top—I think it was a mortar—we should never have been able to reach the summit of that plateau. This is only one of the many happy and fortuitous circumstances which enabled us to bring an expedition to a successful end which might have had a very different termination. Indeed, I believe that if any military expert were to have forecasted that expedition on the basis of such events as did actually occur, he would have been called a lunatic. But I fully agree with all Mr. Blundell has said about the climate of Abyssinia. In spite of that diurnal rain which we experienced in the north, as he did in the south, it was one of the most delightful climates I have ever experienced. It beat even the renowned climate of the Himalayas, and that, I think, is saying a great deal. Indeed, with such a climate as that, it can only be a matter of congratulation to the world at large that there really is a prospect of a railway being extended from the present system in the Somali country to the capital, Adis Ababa, where perhaps a friendly rival sanatorium to Khartum may be founded for invigorating the jaded European constitution. Still, if all I hear is true, I think there is a good deal to be done at Adis Ababa before it is likely to become anything like an ideal sanatorium. I can only congratulate Mr. Weld Blundell upon the exceedingly interesting show of pictures he has placed before us to-night. I think they are one of the best series of views I have seen in this hall.

Major Gwynn: I am afraid any remarks I can offer will be rather commonplace after the very interesting lecture of Mr. Weld Blundell. About three years ago I had the pleasure of travelling in Mr. Weld Blundell's footsteps over the route he traversed in 1898, and I can only take this opportunity of thanking him for the great assistance his map was to me. Not only did his map prove an assistance, but, along his route, the spirit of friendliness towards English people was very marked indeed a thing not always common in Abyssinia at that time. Mr. Weld Blundell has told us a great deal about the position of the Gallas as regards the Abyssinians. Part of the time I was in Abyssinia, I saw a good deal of the Gallas near the country in which Mr. Weld Blundell chiefly travelled, and, though undoubtedly they had suffered from Abyssinian rule, yet at the same time one district furnished a great proof of the enlightenment of the government of the Emperor Menelik; although the subsidiary chiefs have inflicted a good deal of hardship on the Gallas and other people, the emperor himself cannot be held responsible for it. The district I mean was at the head of the Dabus river. When the Emperor Menelik invaded the country, he sent on messengers to the chief Galla offering him terms, which were very wisely accepted. Practical independence was guaranteed, and only a small tribute exacted. In consequence that district now is, I suppose, one of the most prosperous in Africa, and there are only about three or four Abyssinians employed in the districts as clerks. This country, after one has come out of the deserted and war-ravished plains of the Sudan, is a most extraordinary sight to see; the whole country is studded with farms, and the people are most prosperous. There is a large plateau, with wide open fields and quantities

of tillage. Lekempti, which Mr. Blundell mentioned, is something of the same sort of country, but it suffered from the passage of an Abyssinian army, and the people are much more oppressed. Nothing could exceed the attraction of the Galla country, and it reminds one of nothing more than a very thickly populated English park, if you can imagine a number of homesteads scattered about a park in England. Sir Thomas Holdich has remarked on the difference between the character of the plateau in northern Abyssinia and in the south, the difference of the rolling hill country and the flat-topped hills. Travelling along the Abyssinian frontier, I noticed the change was very marked when one got north of the Blue Nile along the frontier. The change takes place between 11° and 12° N. lat.

The PRESIDENT: If there is no one else present who would like to make any remarks on the paper, it only remains for us to give our hearty thanks to Mr. Weld Blundell for what I am sure you will all agree has been a most instructive and interesting address.

Mr. WELD BLUNDELL said: I beg to return my heartiest thanks for the patience with which you have listened to me. With regard to the remarks of the gentlemen who have spoken, I beg to remove any apprehension or idea in any one's mind that when I spoke of the Gallas being oppressed by the Abyssinians, I meant in the outlying districts where the Abyssinian chiefs are out of sight, not only of their immediate overlords, but of the Emperor Menelik. The emperor has an extraordinary sense, not only of justice, but punishes most rigorously any infringement or persecution. In the outlying countries of these enormous districts, it is almost impossible for even his long arm to reach, and the consequence is that some of these native chiefs, who have small ragamuffin armies, are able to commit atrocities in the way of extortion or other things that would be discountenanced or even punished severely even in Adis Ababa. Again I thank you very kindly for the way in which you have accepted my lecture

SUGGESTIONS FOR AN INQUIRY INTO THE RESOURCES OF THE EMPIRE.*

By Prof. G. F SCOTT ELLIOT.

THE suggestions which I have ventured to lay before the Research Department were originally formulated some time ago. It is not with any intention of finding fault or in a spirit of hostile criticism that I bring them forward.

No one can be more conscious than myself of the value of the surveys and investigations already made by commissioners and residents, under the Intelligence Department of the War Office, by the Colonial Governments themselves, and in recent years by the Imperial Institute, which has also been doing invaluable work. Already British India, Canada, and Australasia may be regarded as satisfactorily provided for in the way of maps. New Zealand, Mauritius, and several West Indian islands have already maps on the scale of 1 inch to the mile. The Surveyor-General of Natal has published a good map of Zululand on a scale of 5 miles; and, indeed, in places of $2\frac{1}{2}$ miles to the inch. There

* Research Department, January 31, 1906

is already a War Office map on the million scale (15·8 miles to the inch) for British Guiana and a part of British Africa.

Yet, even as regards this preliminary work, which is absolutely necessary for military purposes, we have not yet mapped the British Empire on a scale of 4 miles to the inch. For this reason only, these suggestions seem to deserve the most careful consideration. But a map on a scale of 4 miles to the inch is only a preliminary. A scientific survey should include far more than the mere geographical details. There is not yet such a survey of every colony as will show the forests, grasslands, mountain floras, and mountain woods. Are there maps which would show a geological prospector where he may possibly discover coal or gold or petroleum? Is there a map which will show an intending settler where he will find sheep, cattle, or cornland? Probably in Canada, Australia, and India these details are well known, but it is not probable that they are known or accessible in a great many other colonies. A map is necessary for all the purposes which have been mentioned. It is not for me to say what scale would be sufficiently large for army purposes. But obviously the first step is to get a map of the particular colony selected on a scale which will satisfy the War Office. This map should, of course, include geological information of a broad and general character, but it is for a geologist to decide how far and in what manner this might be most profitably attempted.

But one special object of the survey might be to ascertain the character of the vegetation over the whole of the colony. This study of the general character of vegetations, or modern œcology, can scarcely be said to have thriven in this country. Valuable work is, however, being done both in Leeds and Liverpool. The papers by Prof. Wm. Smith, Messrs. Lewis, Rankine, and Peal, published in the *Journal* are excellent and interesting, but unfortunately, if we except the late R. Smith's papers, Mr. Pearson's on the Ceylon Patanas, and a very small number of others, no other work has been done in this country; and indeed, the Americans threaten to survey Great Britain for us! Scandinavia, Russia, Germany, Austria, the United States, are rapidly piling up an enormous mass of literature, but in this country the authors mentioned, and a very few others, are, I really think, all who have published important works on the new lines.

Unfortunate and deplorable as is this fact, there is no difficulty in finding an explanation. There is no English text-book of this new science of vegetations, and we have been labelled with a barbarous and unintelligible name, viz. œcology. I shall try to show that is a valuable and important subject for research.

Whether jungle forest, light wood, thorn scrub, grass, or desert plants occupy a country, has always been known to depend entirely on the type of climate. Even primitive man was, I think, a good œcological botanist, and knew precisely what moss, wood, etc., meant. But the

splendid pioneer work of Warming and other Scandinavian botanists has made a science of what was previously a rough general idea, not formulated or described in a definite way. We know now, or rather we ought to know, exactly how to describe the natural vegetation in any of our colonies. From the type of vegetation it is possible to know what the climatic conditions are, *so far as regards plant life*, in a manner which was previously impossible. Those conditions, *so far as regards plant life*, tell us, with an approach to accuracy, exactly what plants and domestic animals are likely to thrive in a new unsettled part of any colony.

There are, of course, hundreds of valuable references in books of travel and reports published before the days of the study of vegetations. We should expect this to be the case, for the general character of the plants shows, even to any experienced non-scientific colonial, something of the prospects of cultivation. This study of vegetation is, in fact, to a great extent, common sense applied in a broad general way to the flora of a country. Hitherto botanists have, as a rule, never been able to understand a Wood as a whole, or as a living entity, because they were cataloguing the trees. European botanists have only recently studied Marsh and Moors, because hitherto they have, perhaps, lost themselves in the intricacies of Salix, or been overwhelmed by the genus Sphagnum. I have myself done too much of the dry thankless work of collecting and describing systematically not to be aware of the potential value of such work provided it be accompanied with full details. For my own part, my duty was to collect, and all my available time was occupied in that laborious task. Others have found themselves in the same position.

This new study of vegetations is of much greater importance, because it is so closely connected with practical agriculture. Thus, for example, in the colony of Rhodesia, it is quite certain that the tropical jungle of the Zambezi valley extends into Rhodesia. That tropical wet jungle, we know from experience in other parts of the world, is at present, perhaps, the most useless kind of country. There is, probably, along its border a fringe of more valuable monsoon forest. But a considerable proportion of Rhodesia is certainly temperate grasslands, and capable of tremendous development. A well-trained and experienced vegetation authority could mark out on a map the approximate boundaries of these vegetations. This would be of inestimable value.

I have been specially impressed by my own experiences, of which I shall particularize a few. In South Africa, the climatic regions are not even now definitely mapped off. In West Africa, I have never seen even an approximate sketch of the boundary of the wet jungle of the coast as distinguished from the light woods and grasslands of the interior. In East Africa, I am glad to see that the authorities have at last realized the importance for settlement of the fertile healthy grasslands on the

Mau plateau. It is true that there is no reason why they should have waited ten years before following out my suggestions, which were confirmed by every one qualified to judge, and which were by no means new even then. Yet I do not think any boundary has been drawn between (1) the healthy temperate grasslands, (2) the forests, (3) the thorn scrub, and (4) the Uganda plateau. There will undoubtedly be serious financial loss if these distinctions are not carefully mapped and thoroughly appreciated. The ordinary traveller describes, for instance, a wood, but this might be either a thorn scrub, a wet jungle, a tropical monsoon wood, or a temperate wood. The values and the prospects of these are as different as possible. Therefore, it seems to me that a map on which these vegetation zones are marked in a broad general way would be a most valuable production. For this survey a special colony might be selected, say Zululand or Rhodesia, by the Research Department of the Royal Geographical Society. Those who are entrusted with the survey, or with part of it, should be given all possible assistance, and especially with regard to observation of the sort of vegetation, and the marking off in a broad general way of grassland, wet jungle, marsh, true forest, etc.

The second part of my suggestion relates to the work which might be done at home. If any person wishes to get up the history and geography of any colony or district, he will probably take notes of the books and papers cited in the 'Statesman's Yearbook.' Then, if he is anxious to do the work thoroughly, he will consult the Card Catalogue in the Royal Geographical Society, which gives references to the 256 journals which refer to geography. Another very necessary point is to find out exactly what are the official Home or Colonial Government publications about the colony chosen. There must be, one would suppose, some theory in the minds of Government officials as to the way in which a private person is supposed *first* to find out, and *secondly* to see what has or has not been published by Government. I have reflected and speculated on this subject, but I have never yet been able to discover what the theory is. At any rate, it is quite impossible for the earnest inquirer in the country to do either the one or the other, although those reports are nominally for sale at very low prices. It is exceedingly difficult to see them, and impossible to obtain them. Instead of charging 1*d*. or 2½*d*. for a report, the obvious reasonable course would be to increase the price, and to give any book-seller or newsagent double the ordinary trade discount for selling those reports. There is less difficulty in London, for he can consult the complete collection of the Royal Colonial Institute. The Royal Geographical Society also ought certainly to receive without payment every Government publication. But I do not think we get even some of those which are handed to every member of Parliament. If, however, the Society did receive every Government publication, then the cataloguing and

filing for reference would present no difficulty to us. This would render available to our members an enormous accumulation of valuable details.

Surely, for the sake of earnest inquirers in the country, all Government publications should be presented to every free library in the United Kingdom? Another excellent suggestion has been made to me, viz. that lists of geographical publications should be regularly supplied to all post offices. Then in the country one might have some chance of studying thoroughly. No private person can be expected to subscribe to the R.G.S., Royal Colonial Institute, Society of Arts, *Bulletin of the Imperial Institute*, *Kew Bulletin*, *Journal of the Board of Agriculture*, *Board of Trade Journal*, and many others as well. But, as must be obvious, the work at home of such a systematic survey is quite possible with the Card Catalogue of the R.G.S., the help of the Royal Colonial Institute, and of the Imperial Institute.

Why should this work be undertaken by the Research Department of the Royal Geographical Society? Because, undoubtedly, this work can be done better and more thoroughly by the Society than by any other body. The Society is able to obtain the support of both Home and Colonial Governments. But it is not obliged to carry on its business by the methods adopted by the British Government. Those methods, I think, are regarded with very moderate enthusiasm by those who have in any way experienced them. But the advantages of the Society's position at home and abroad are very great. Naval and military officers might, by its influence, obtain leave and some help to explore particular districts. Indian surveyors might be imported. Our Fellows resident in the district would, no doubt, assist to the best of their power. Moreover, the Society is in touch with those who have the means and desire to travel. A work of this sort is utterly beyond the reach of any private individual.

I will venture to give some practical details. Suppose that one colony, say Rhodesia or Zululand, has been chosen as a good subject for systematic inquiry. Then the first step would be for the Research Committee to place the entire direction of it in the hands of one man. There are always in London men of standing and position who have but recently returned from the colonies, and who would, I believe, take great pleasure in such work. The director should be supplied with a special clerk to work under his orders. At home it would be necessary to gather together as complete a list as possible of the literature dealing with the colony. It would be necessary to find out and state where the important books and papers can be seen. If money can be spared, it might be advisable to translate or to make an abstract in English of any important foreign works, especially if they are in difficult and unusual languages. Very soon it would be seen where information is lacking, and what parts of the colony require special exploration

or a detailed survey. Then it might be necessary to ask for help in surveying those unknown parts. No doubt a very large amount of assistance would be volunteered as soon as it was known that the Royal Geographical Society had undertaken such a task. The director would, of course, ask for help wherever it could possibly be given, and would be asked to report progress to the Research Department.

I am quite unaware if there are funds at the disposal of the committee for such purposes, and if there are such funds, I do not know their amount. But I do not think that there will be any lack of financial help when the character of the work is understood in the colony and at home. I am afraid a certain amount of obstruction would be encountered from those who already possess valuable special knowledge, and do not desire this to be generally accessible. Yet such obstruction from interested parties should not be an insuperable difficulty. Although I do feel the great importance of scientific geographical work of a highly technical nature, yet such an inquiry as this would be not only scientific, but of direct and immediate practical value. Its obvious practical advantage would bring the Society into closer touch with many prominent men both in the colonies and at home.

Before the paper, the CHAIRMAN: Mr. Scott Elliot is with us to-night to give us an address on a subject which is of rather unusual interest to the Society, and as I hope the paper will be followed by discussion, I will at once ask Mr. Scott Elliot to commence his address.

After the paper, the CHAIRMAN: Mr. Scott Elliot has made several very interesting suggestions which will no doubt lead to discussion, but I must ask you to remember the limitations of time. I will commence by asking Sir George Goldie to make a few remarks.

Sir GEORGE TAUBMAN GOLDIE: I am glad to speak because, as President of the Society, I would like to show the value that I attach to a great deal that is in Mr. Scott Elliot's paper. I agree with him in excluding India and Canada from our purview to-night, because in India there is the Government Survey, Forestry Department, and so forth; while in Canada there is the Geological Survey, which deals with various branches of science, and other similar institutions, which, I think, cover all that could at present be expected in the direction Mr. Elliot indicates. He mentions the want of maps in Natal during the war, and takes that as a basis for his thesis. I wish to say, having been on the War Commission, that there was a map of the north part as far as Ladysmith. It was not completed throughout Natal, owing to the difficulty of arranging with the Natal Government, which at the moment could not find the money for it. In those days, there was a feeling among some of the self-governing colonies, which one quite understands, of not liking to see independent survey work by officers from home. The Intelligence Department gave our commission an estimate as to what it would cost to make a survey of British Africa. They said that, if spread over twenty years, it would cost about £90,000 a year; that means about two millions altogether. It would not be a complete map, such as an œcologist or geologist would desire. We then asked what it would cost to survey all the unsurveyed portion of the British Empire;

they told us about £150,000 a year, or in all three millions. I wonder whether the present House of Commons would undertake that liability. It may be they would, and I certainly think we ought to press in that direction. We have to teach our compatriots that knowledge is economical, and ignorance very costly. The difficulty is how to get the public ear. Mr. Scott Elliot says that the public ought to know this and that, but how are you to reach them? Most people do not read advertisements; besides, they are costly. There are few things more difficult than to get a fact into the public mind. Mr. Scott Elliot told us that two of the great towns in the north of England are taking an interest in œcology. I need hardly say we sympathize with them, and applaud them. But I hope any results they obtain may be communicated quickly and freely to the Royal Geographical Society, so that there may be continuity of record and facility of reference.

Mr. Scott Elliot hopes he is not alone in his desire for systematic exploration. I have been fifteen years on the Council of this Society, and I can vouch that we have been fully alive to the necessity of systematic exploration. I can assure Mr. Scott Elliot that the œcologists will be supported by this Society. But I should add that during the last half of the nineteenth century more attention was necessarily paid to extensive exploration; it could not be otherwise. I venture to say that, although Mr. Scott Elliot did admirable work when he went to Ruwenzori, he would never have had an opportunity of going if there had not been H. M. Stanley and others who preceded him. I endorse many of Mr. Scott Elliot's views, but I would point this out, that some of them involve a great deal of expenditure. I should like to see the money spent, but we must obtain it first, and I hope we shall have support in pressing the Government for a large increase of our present derisory grant from the State—a grant made half a century ago when we were an infant and unproved Society.

Sir GEORGE WATT: I did not expect you would call upon me to speak, because my country (India) has been barred altogether from consideration. I have spent a considerable portion of my life in India, and what knowledge I possess on the subject of Mr. Scott Elliot's lecture is entirely concerned with that country. However, I shall in a very few words endeavour to convey some of the ideas that have passed through my mind both in reading the paper and listening to the remarks Mr. Scott Elliot has made, since my personal knowledge of the subject may probably help, if any department, such as has been sketched out, is ever actually made in connection with any colony. We are not exactly ignorant of the subject of œcology in India. We have a great Survey Department, a Forest Department, an Agricultural Department, a Geological Survey, a Botanical Survey, a Zoological Survey, an Archæological Survey, and a Reporter on Economic Products, and all sorts of learned societies. Still we have not, strictly speaking, commenced the work Mr. Scott Elliot recommends; we are only in the stage of preliminary scientific exploration which, as has just been suggested, should precede œcology. By way of illustrating my meaning, I may give one or two examples. If you imagine the Ganges and the Brahmaputra severing India into an eastern section, which has now become the new province of Eastern Bengal and Assam, from a western—the rest of India—you have a division which is a very curious and natural one. The great waterway separates characteristic vegetations in a very remarkable manner. For instance, on crossing the Ganges, the first point that might strike an observer would be the comparative disappearance of leguminous trees. On the other side, the western side, the *Acacia arabica* is exceedingly prevalent; across the Ganges it becomes exceedingly rare. That is related to a series of other facts, and brings out an idea with regard to the province of Eastern Bengal and Assam which is unique almost in Indian experience. Had

we gone into this subject carefully years ago, we might have seen that portions of Eastern Bengal and Assam were essentially countries for tea, and we should have saved no end of money and time had that idea come home to us. Eastern Bengal is essentially Chinese in its floral type. To be more correct, it is much closer to China than to India, and this comparison is not confined to its botany, but may be traced in its people, their customs, habits, and in some respects even their language, etc. For instance, in Eastern Bengal, the vegetable most largely grown, of the cabbage family, is a close ally to Chinese cabbage, and the original inhabitants, not the Bengali immigrants, all use vegetables which are often quite different from those on the other side of the Ganges. For instance, a chrysanthemum is a common vegetable there, but nowhere exists on the other side of the Ganges. One might multiply illustrations innumerable in order to show that there is something more than mere latitude, climate, geological structure of soil, or even humidity; there is something we do not understand. Some years ago at this Society I was called upon to speak in connection with a paper which was read by Major McGregor on an exploration from Assam into Burma. I then made a remark that seemed to cause a little excitement to the late Sir Henry Yule, who was present at the meeting. I said there was something in the botany of the eastern side of India that we had not yet explained, and I gave illustrations in the behaviour of the rhododendrons. In Manipur and the Naga hills the selfsame species are found at much lower altitudes than in Sikkim. Is œcology likely to deal with such phenomena? If so, it will render a great service to the world. Some few years ago I wrote a little paper in the *Agricultural Ledger* on "Crops in Relation to Climate." It seemed to attract some attention in the United States of America, and I was called upon by the Government of India to follow the matter up further. The keynote of my observations was that humidity was in India apparently a more potent factor than temperature. I gave an illustration, namely, if you were to start at Lahore, say in June, and fly across India in one day to the extreme south, you would see the land being prepared for wheat, being sown with wheat; you would see the wheat germinating, mature, being reaped, threshed, and being carried to market. As a consequence of this, we possess in India, under each crop, a series of forms suited to a multitude of conditions that is perfectly bewildering. After the most careful consideration and consultation with experts interested, I drew up and issued to every collector and magistrate in India, a circular letter in which they were called upon to give me returns with regard to the sowing and reaping of certain crops. A list of the crops of which particulars were wanted was printed, and a table supplied like a census return, calling for the dates of normal and extreme sowings and reapings. The returns duly came back to me, and were so voluminous that they ran to a volume of over a thousand pages. We are still, after five or six years, working at these returns, and hope, probably in the next ten years, to be in a position to publish the Report. Such, then, is one out of the many examples of œcological research that we in India have been endeavouring to prosecute, and such inquiries will have to be faced if Mr. Scott Elliot's theories are to be put to a final and practical test. I am afraid I should detain you too long to go into more illustrations, therefore I will only venture to add one or two words. Mr. Scott Elliot referred to a poisonous bean. I was one of the first of modern writers to draw attention to that subject. Of course it has been known from time immemorial, that the *Lathyrus sativus* pea, if eaten continuously for some time, will cause paralysis of the lower extremities. But a new feature seems to have arisen. A bean sent to England, which I believe to be *Phaseolus lunatus*, is said to have proved poisonous. Before accepting this view I should prefer to think there was a mistake somewhere, as the cultivated bean in question

has never before been suspected to be anything but perfectly wholesome. I will not say anything more, except to express my regret that this Society should say, if it does finally say, that India should be excluded. If we are going to have any such inquiry at all, let India be included by all means, and our scientific men will welcome a helping and encouraging hand. But we have nothing like the organization that would be indispensable to conduct an ecological survey. We should want an army of observers and workers that Government will, I fear, never give us unless a strong case can be made out for this new departure. By excluding us you are not giving us a helping hand, and we want the Royal Geographical Society to say this work is an important piece of work which should be done in India as well as in every other country, if such be the final opinion.

Mr. Scott Elliot: I have pleasure in testifying to the tremendous help Sir George Watt's dictionary has been to me in all my scientific work. I thank you very heartily.

Major Close: I think we are much indebted to Mr. Scott Elliot for having brought this subject to notice again. I wish to make a few remarks from the point of view of the official world. It is true that the only map we had of South Africa was of a little triangular bit of the north of Natal, and the reasons for that are reasons which I must not advert to. Perhaps it would be interesting if I say what is going on in Africa at the present moment, because I do not think the lecturer knows what is going on. We have a Survey Department properly organized on the Gold Coast. They have funds at their disposal, and the work is of a very accurate character. Next, we have a survey proceeding in the Orange River Colony, which, though perhaps not quite so rigorous, is sufficiently rigorous for the purpose of making a map on the scale mentioned by Mr. Scott Elliot. The scale it is actually working on is 2 miles to the inch, and they are turning out about 10,000 square miles a year. A survey has been approved of on systematic lines for British East Africa, and the organization of that is proceeding, and a commencement will be made in April next. The survey of Southern Nigeria and Lagos is to be systematized. Excellent work is being done in Uganda. The net result of all this is, that under instructions from the Colonial Office, the local governments in Africa are at the present moment spending over £40,000 a year, but since these surveys have only been commenced quite recently, it is too soon to expect many results just yet. We shall see those results in a few years. Most of these areas I have been speaking of were either crown colonies or protectorates—that is to say, colonies administered from home. But a self-governing colony runs its own show. If this Society could persuade the self-governing colonies in Africa, if it could persuade Natal to undertake a systematic survey, it would be of the greatest possible value to soldiers. The War Office has for many years past done its very best to encourage the mapping of the empire. No effort has ever been wanting on the part of the War Office to get maps made. Mr. Scott Elliot mentioned the question of scales. He said, "The first step is to get a map of the particular colony selected on a scale which will satisfy the War Office." The War Office will be satisfied with a scale of 2 or 4 miles to the inch, according to circumstances; or say 1 : 125,000 or 1 : 250,000. I do not know whether we have any definite proposition before the Research Committee, but if there is a definite proposition, it seems to me to be that the Society should undertake the exploration of either a portion of Rhodesia or Zululand. I think it would be a very excellent thing if the Society were to undertake the former.

Major Hills: I should like to make two or three remarks upon this subject. First of all, with regard to the general question of mapping the British possessions, I think that Mr. Scott Elliot has been unduly optimistic in his statements, because

he said that he thought that, though there were only very few maps published by the Intelligence Department of the War Office, they had probably a very large secret stock of maps. Now, I think I may say without divulging any official confidence that these secret stocks do not exist. The whole question of the maps was gone into before the war commission which Sir George Goldie has already quoted, and has been made public, and it would be only in the nature of a dangerous delusion for people to suppose that the War Office holds large numbers of secret maps which are not issued. As regards the general question which is before this meeting, I must confess I have rather a vague idea as to what the actual proposition is. It seems quite hopeless to suppose that the Society could do any perceptible amount of survey work. The President has given figures showing the cost of a survey of the British Empire or British possessions in Africa, and anybody who looks at those figures will see that a Society which has not many thousands a year to spend could not make great progress. Take, for instance, another example as illustrating this point. The Survey Department of India—that is, only the Trigonometrical and Topographical Surveys, independent of the Botanical, Mineralogical, and Geological Surveys, cost about a quarter of a million a year, and if you look at the area of India, you will see that you will have to multiply that sum several times over if you are going to do the whole empire on the same sort of scale. I do not see what the Society can do, even with a small country such as Zululand. They cannot carry out a survey of this nature—topographical, botanical, and geological—so as to complete it within any reasonable period of years. It seems to me that the right line of action for the Society is to bring pressure to bear upon the Government to spend more money upon the survey of the empire. I am going to say a thing which may be rather unpopular, but I really think it would be better if the Society, so to say, stuck to its own last and did not go outside the geographical question. I think if we go beyond that and enter into these commercial questions, questions relating to the economic vegetation of the country, or the geology or the mineralogy, we shall get beyond our legitimate sphere, which is the study of scientific geography. We are, I take it, not a commercial Society, and I think we had better not go into questions which are so directly commercial in their bearing. Our *rôle* in this matter is to make public as often and in as many directions as possible, the want of geographical surveys of the empire, and to lose no opportunity of impressing upon the Government and upon all public men the urgent necessity of carrying them out.

Mr. FITZGERALD: It has given me great pleasure to be present to hear Mr. Scott Elliot's remarks on a subject that should appeal to every one interested in the development of the commercial resources of our empire. I believe, however, the Imperial Institute does take up this subject, and that one can obtain information there, not only as regards products, but all Government publications as well. I am very glad that this subject has been ventilated, because there is no question more important than the increase of our knowledge of commercial geography. It is one in which I have always taken a very great interest, but, as Sir George Goldie has truly remarked, it is a most difficult matter to get the people of this country to evince the interest they should in this important question. I can speak from personal knowledge as to this, and I will give an instance in point. I gave some lectures last year in Lancashire on the great possibilities of the Sudan as a cotton-growing country. On one occasion a gentleman who was present came up after the lecture and expressed his astonishment that the Blue Nile was in the Sudan! I need not point out that the Blue Nile valley is one of its richest parts.

The Blue Books and reports that are published annually on the various parts

of our empire contain often most valuable information. They appear, are read by a select few, and then pass into undeserved oblivion, and it has always been a matter of great regret to me that the information they contain could not be gathered together and brought up to date. For instance, an administrator, on first going out to one of our comparatively new tropical possessions, spends a good deal of his own and his country's valuable time in obtaining information that is already available. Had he only been able to take out with him a condensed summary of the reports issued by his predecessors as to the capabilities and possibilities of the country, how much more valuable his own first report would be! I earnestly hope that the suggestion which has been advocated by Mr. Scott Elliot will be considered and not allowed to rest, and that the eminent gentlemen who are present will bring their knowledge and experience to bear upon it so that some definite and permanent result may be attained.

Dr. John W. Evans: I rise to say a few words about what is being done at the Imperial Institute in the direction which has been advocated by Mr. Scott Elliot. Prof. Dunstan, the Director, intended to be present, but he was detained at the last moment, and I must do my best to replace him.

In the first place, it is not enough to send out an expedition to survey a colony still comparatively undeveloped. It is impossible for even the most skilled specialists to investigate satisfactorily the problems that present themselves, and which are important for the determination of the lines on which the colony may be best developed, unless they have at their disposal the resources with which science has supplied us, and that are only fully available in technical establishments such as the Imperial Institute. It is not enough to report that iron or lead or manganese is present in considerable amount; the value of a deposit of iron or manganese is affected by minute amounts of certain impurities, while the question whether lead ore can be worked at a profit depends largely on the presence of a few ounces of silver in the ton. In regions that appear capable of agricultural development, the soil requires careful examination and analysis, and vegetable products, such as rubber, fibre, and essential oils, can only be properly investigated in adequately equipped laboratories. Not only have we the laboratories, but there is a staff of some two score of chemists, mineralogists, and botanists who are fully competent to deal with such questions as may arise. As Sir George Watt has referred to the subject of poisonous fodder plants, I may mention that we have already examined a number of these from different localities; the constituents have been determined, and, as far as possible, we have endeavoured to ascertain why this variety or that is poisonous, and in this connection have been supplied with detailed information as to the conditions under which they were grown (Dunstan and Henry, *Proc. Roy. Soc.*, 1901–04).

Besides examining the mineral and vegetable products forwarded to us, we have sent out specialists to make observations and gather materials. Three years ago Mr. Parkinson, a geologist of high reputation and a Fellow of this Society, and Mr. Huddart, a skilled mining engineer, commenced the mineral survey of Southern Nigeria and Lagos, which is still proceeding. They carry on exploration in the colony in the dry weather, and in the wet season they work out at the Imperial Institute their notes and specimens, the latter having meantime been analyzed by the chemists. Already results of importance have been obtained—deposits of coal, pitch, tin, and the mineral monazite, which furnishes thoria for our gas mantles, have been studied, and at the same time assistance has been afforded to the topographical survey. More recently a mineral survey has been organized in Northern Nigeria on similar lines under Mr. Falconer, formerly chief assistant to Prof. James Geikie.

Another member of our staff, Mr. Freeman, a well-known botanist, has also spent some time in Nigeria, and the materials he brought back have been investigated at the Imperial Institute. Still another, Mr. H. Brown, a chemist who has devoted special attention to rubber, visited the Bahr el Ghaza, and investigated the possibility of developing the rubber and other natural resources of the province. Again, Mr. Coomaraswanny, an able geologist, is working with an assistant in Ceylon, where the new mineral thorianite—far richer than monazite in thoria—has been discovered as the result of analyses at the Imperial Institute. At the present moment negotiations are in progress for other expeditions, and there seems no limit to the work that may be done if we are properly supported with funds.

I may add that the library of the Imperial Institute is well supplied with literature relating to the British colonies and dependencies, and we do our best to keep it up to date.

Sir George Goldie: Lest there should be any misunderstanding, I should like to say the Council of the Royal Geographical Society made a representation at the same time as the Royal Society. I shall not reply in detail to the remarks made with regard to the sphere of the Royal Geographical Society. That depends upon the question—what is geography?

The Chairman: It appears to me that the two questions before us to-night are, firstly, the possibility of putting more varied information on our maps than they contain already, which I think is one which will require much consideration. There is, for instance, a great deal of botanical information which obviously it would be impossible to include in any map whatever. And, secondly, whether the Society should assist in any way to the better distribution of such information as we possess. I agree with Sir George Goldie that it is exceedingly difficult to persuade people that they can get information if they only ask for it. As a matter of fact, between the Colonial Institute and the Royal Geographical Society, I take it that any explorer might equip himself with pretty nearly all the information he requires; but it is very necessary to advertise this fact, and I think that we might possibly do a little more than we are already doing towards making it known where the real sources of information lie. We ought seriously to consider whether we cannot give some practical outcome to the suggestions which have been made. What can the Society really do? I think that we might form a committee of the Research Department to consider in what direction we can work with the best chances of success, both as to making information known to those who require it, and as to giving assistance towards producing an economic map. We might try the experiment which Major Close has suggested, and see what comes of it. As regards Major Hills' remark that one quarter of a million is spent on the Survey of India, and his conclusion that it would require a very enormous expenditure to survey the whole of the empire, I do not think Mr. Scott Elliot proposes for an instant that all the empire should be surveyed as India has been surveyed. There are all sorts of surveys in India—geographical surveys, topographical surveys, trigonometrical and revenue surveys, which latter reach the scale of 24 inches to the mile. The first cost of making a geographical map is, I consider, nothing that should be prohibitive, even if we consider such a large question as the empire as a whole. I have had considerable experience in framing estimates for surveys of that class, and certainly should have thought it would not have cost nearly as much as the amount suggested by Sir George Goldie.

Sir George Goldie: I did not say it; that was the evidence put before us.

The Chairman: I should have thought it would have cost perhaps half of that. I will now ask Mr. Scott Elliot to reply to some of the criticisms that have been

offered to his paper, and then we must conclude by thanking him for giving us such a very interesting afternoon.

Mr. SCOTT ELLIOT: I must thank you very sincerely for the encouraging support which I have received from almost everybody who has spoken. First of all, with regard to expeditions of the Imperial Institute and of the Intelligence Department of the War Office. The more there are, the better I shall be pleased. But I wish earnestly to bring before the Research Department a very definite and distinct proposal that the Royal Geographical Society should itself undertake some colony and do it on these modern lines. There is, first of all, the difficulty of cost, but I would like to point out that if the Society were to approach any colony in the right spirit, and show that we simply wished to assist them to carry out a scientific survey, I fail to see where such a colony could find a reason for objecting. Then there is the difficulty of interesting the public. Now, some remarks of the last speaker explain precisely where that difficulty comes in. If we can make the public understand and realize that points of practical and commercial importance are solved by scientific treatment, then we shall no longer have any difficulty in interesting everybody. But there is a tendency in the science of this country to adopt an esoteric spirit, and to cut itself aloof from practical life, and then of course the public says that it cannot be bothered by scientific matters which do not explain anything that it wishes to know. I think our Society should most certainly keep in touch with practical men. I sincerely hope that the Research Committee will choose some colony, so that we can show what we can do when we have the chance of doing work on the very best modern scale.

Prof. WYNDHAM DUNSTAN, F.R.S., Director of the Imperial Institute, who was unable to be present, has written the following remarks :—

The valuable suggestion of Mr. Scott Elliot, that a systematic survey of the undeveloped portions of our empire should be undertaken in turn, is one which I hope will not be lost sight of. What is required is a definite scheme of operations determined upon by the various societies and bodies interested. We require a topographical survey, and a survey of the vegetable and mineral resources, of the climate and sanitary conditions of each of the regions, chiefly directed to the end of opening up these countries for the development of trade and commerce. Funds are required, but it will not be questioned nowadays that the cost of work of this character should be undertaken by Government. Large sums of money are annually expended on the administration of these countries, but until recently little or nothing has been expended in this economic work, which is a necessary preliminary to commercial development. The department chiefly concerned is the Colonial Office, under whose auspices the work could be best undertaken.

It is, however, obvious that such surveys will have little result unless the collected materials, vegetable and mineral, are submitted to full examination, especially from the chemical side, and then commercially valued and brought to the notice of the commercial community. By this means only will the expenditure be fully justified in the eyes of the Government, and a certain return in the shape of revenue secured.

An organization for accomplishing this working up of materials now exists, as Dr. Evans has pointed out, at the Imperial Institute. It deserves to be better known, and more liberally supported with funds. What it has accomplished in the last few years may be learned from its 'Bulletin' and published reports. Its work is carried on in close co-operation with the Colonial Office and the Colonial Governments concerned, but its permanent staff, numbering between thirty and forty skilled workers, is so small for the work it is called upon to do that but few of its members can be spared for the work of exploration on the spot which is so

necessary. Six men are, however, so engaged in the colonies at the present time, and it may be said that the economic survey of British West Africa is already well in hand. The Imperial Institute supplies the nucleus and permanent staff for dealing with the results of these surveys and this work, which can only be properly conducted in London. It remains to determine how the scheme of surveys is best arranged.

Through the Colonial Office as the controlling body, with the co-operation of the Royal Geographical Society, the London School of Tropical Medicine, and the Imperial Institute, an efficient plan of operations ought to be easy to arrange. But the ground to be covered is enormous, and, as Mr. Scott Elliot suggests, it will be prudent to take one country at a time. Personally, for many reasons, I should be inclined towards the selection of West Africa for the first action, and that because so much is already arranged on the proper lines for the initial development of that vast country.

[Prof. Wyndham Dunstan's support of my suggestions is extremely gratifying, and the Imperial Institute would be of an inestimable assistance to the survey. Yet I must protest strongly against his view that either the Colonial Office or the Imperial Institute could possibly conduct such a survey so well as the Royal Geographical Society. The Colonial Office has in the past, and will no doubt in the future, continue surveying and reporting, but no Government office could possibly undertake or control work of this nature. Otherwise such work would have been done long ago.—G. F. S. E.]

BATHYMETRICAL SURVEY OF THE FRESH-WATER LOCHS OF SCOTLAND.*

Under the Direction of Sir JOHN MURRAY, K.C.B., F.R.S., D.Sc., etc., and LAURENCE PULLAR, F.R.S.E.

PART XI.—THE LOCHS OF THE BEAULY BASIN.

THE Beauly basin is an important and extensive one, extending across almost the entire width of Scotland, from Beauly firth on the east coast to within about 4 miles from the shores of Loch Duich, and about 6 miles from the shores of Loch Carron, on the west coast. The basin is situated in a very mountainous district, many of the peaks in the central and western part of the basin exceeding 3000 feet, and some of them approaching 4000 feet, in height, while on proceeding eastward towards the outlet of the basin the land becomes gradually less elevated. On the southern boundary of the basin are Tigh Mor (3222 feet), Sgùrr nan Conbhairean (3634 feet), Garbh Leac (3673 feet), Sgùrr nan Ceathramhan (3614 feet), Ciste Dhubh (3218 feet), Carn Fuaraloch (3241 feet), and Sgùrr a' Bhealaich Dheirg (3378 feet); on the western boundary Beinn Fhada (Ben Attow), 3383 feet, Sgùrr nan

* Plates, p. 656.

Ceathreamhuan (3771 feet), Lurg Mhor (3234 feet), and Sgùrr Choinnich (3260 feet); on the northern boundary Sgùrr a' Chaoruinn (3452 feet), Bidean an Eoin Deirg (3430 feet), Maoile Lunndaidh (3294 feet), Sgùrr Fhuar-Thuill (3439 feet), Sgoir a' Choir-Ghlais (3552 feet), and Sgùrr Ruadh (3254 feet); while in the central part of the basin are Craig Dhubh (3102 feet), Sgùrr na Lapaich (3773 feet), An Riabhachan (3696 feet), Beinn Fhionnlaidh (3294 feet), Mam Sodhail (Mam Soul, 3862 feet), Carn Eige (3877 feet), Tom a' Choinich (3646 feet), a second peak named Sgùrr na Lapaich (3401 feet), and Tuill Creagach (3452 feet). Besides these heights there are many others which do

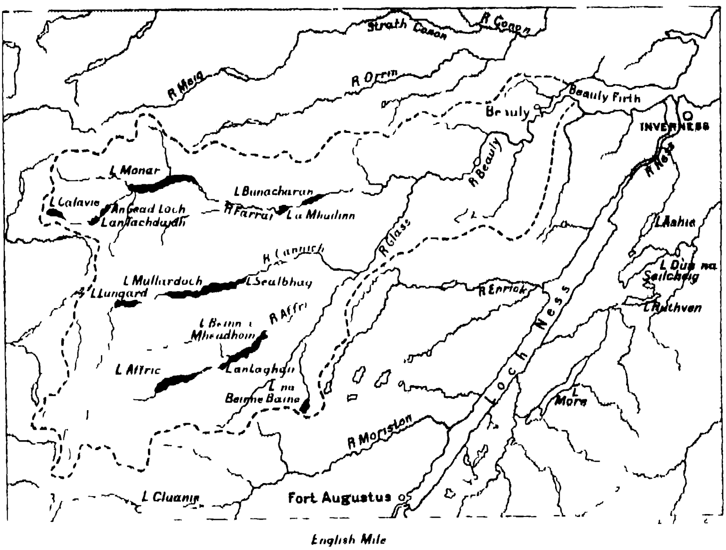


FIG. 1.—INDEX MAP OF THE BEAULY BASIN.

not attain the 3000-feet level. In the valleys between these chains of mountains lie the lochs which were sounded by the Lake Survey staff. In the most northerly valley, Glen Strath Farrar, there is the connected series consisting of Lochs Calavie, an Tachdaidh, an Gead, Monar, a' Mhuilinn, and Bunacharan; in the central valley, Glen Cannich, the connected series of Lochs Lungard, Mullardoch, and Sealbhag; and in the most southerly valley, Glen Affric, the connected series of Lochs Affric, an Laghair, and Beinn a' Mheadhoin; with the isolated Loch na Beinne Bàine as an outlier situated towards the head of Strath Glass. These valleys all trend in a more or less east-and-west direction, converging towards the north-east, where the river

Beauly is formed by the junction of the river Farrar with the river Glass. The river Glass is formed by the junction of the Amhuinn Deabhaidh (bearing the outflow from Loch na Beinne Bàine) with the river Affric, while the river Cannich is a tributary of the river Glass. The river-systems within the Beauly basin, and the relative positions of the different lochs, are shown on the accompanying index-map (Fig. 1). The area of the entire basin, as measured with the planimeter on the 1-inch Ordnance Survey maps, is about 343 square miles, of which about 215 square miles (or 63 per cent.) drain into these thirteen lochs, as will be seen from the summary table at the end of this paper. An inspection of the summary table shows, further, that all the lochs exceed half a mile in length, while eight of them exceed a mile in length; the two largest lochs (Mullardoch and Monar) exceed 4 miles in length, and have each an area exceeding a square mile. Seven of the lochs exceed 100 feet in depth, and two of them exceed 200 feet, the deepest one being Loch Monar with a maximum depth of 260 feet; this loch is also the one containing the largest volume of water. The boundary-line between the counties of Inverness and Ross runs up the centre of Loch Monar for the greater part of its length, and it crosses Loch Mullardoch in its central portion, so that these two lochs lie partly in Ross-shire and partly in Inverness-shire; four of the others (Lochs Lungard, Calavie, an Tachdaidh, and an Gead) are situated in Ross-shire, and the remaining seven in Inverness-shire. The scenery of the district around the lochs is very fine, and the trout-fishing in most of the lochs very good; some of them contain pike also.

Loch Affric (see Plate I.).—Loch Affric (or Affaric) lies about 26 miles to the south-west of Beauly, which is the nearest railway-station, and about 11 miles from Glen Affric Hotel at Cannich, the nearest house of entertainment. The loch trends in a west-south-west and east-north-easterly direction, and is nearly 3¼ miles in length. It is broadest towards the western end, where the maximum breadth is nearly half a mile, narrowing gradually, though irregularly, on proceeding towards the eastern end, the mean breadth of the entire loch being a quarter of a mile. The superficial area is about 526 acres, or over four-fifths of a square mile, and the area drained by the loch is nearly 47 square miles. The maximum depth of 221 feet was observed near the centre of the loch. The volume of water is estimated at 2146 millions of cubic feet, and the mean depth at nearly 94 feet. The loch was surveyed on October 6 and 7, 1903, when the elevation of the lake-surface above the sea was determined by levelling from bench-mark as being 747·0 feet; when levelled by the officers of the Ordnance Survey on July 3, 1867, the elevation was found to be 744·1 feet above sea-level, or 3 feet lower than 1903.

Loch Affric is quite simple in conformation, the deeper water

occupying a central position, from which the bottom slopes upward to the shores on all sides. The 50-feet contour coincides approximately with the outline of the loch, enclosing a basin nearly 2½ miles in length, approaching comparatively close to the west end, but distant more than a quarter of a mile from the east end. Separated from this main 50-feet basin by shallower water is an isolated sounding of 54 feet, near the east end where the main loch is joined by the little subsidiary basin called Loch Pollan Fearna, in which a maximum depth of 30 feet was observed. The 100-feet basin is 2¼ miles in length, and the 150-feet basin nearly 1¾ miles in length, approaching in each case nearer to the west end than to the east end. The 200-feet basin is about three-quarters of a mile in length, and is approximately equidistant from both ends of the loch, but the deepest sounding in 221 feet was taken towards the west end of the basin, and therefore nearer to the western end of the loch. A section along the centre of the loch from end to end is shown in the longitudinal section A–B on the map, and a section across the loch in the position of the deepest sounding is shown in cross-section C–D. This last section shows a very slight irregularity in the deepest part of the loch, where a sounding in 209 feet was taken between a sounding in 211 feet on the one hand, and the greatest depth of the loch (221 feet) on the other. Another line of soundings, about three-quarters of a mile further east, shows a shoaling in deep water, where a depth of 122 feet was recorded between a depth of 130 feet on one side, and 159 feet on the other. With these exceptions, the various lines of soundings show a regular bottom, with a steep off-shore slope in some places along both the northern and southern shores. Thus, proceeding along the northern shore from the east end of the loch, the first line of soundings gave a depth of 40 feet at a distance of 20 feet from shore; the fourth line of soundings gave a similar depth at a similar distance; the fifth line gave a depth of 28 feet at 10 feet from shore; the ninth line gave 17 feet at 30 feet; the next line gave 21 feet at a distance of 20 feet; the next line 84 feet at 60 feet distance; the next 35 feet at 25 feet distance; and the next line 36 feet at 30 feet distance. In like manner proceeding along the southern shore from the east end, the sixth line of soundings gave a depth of 76 feet at a distance of 50 feet from shore, the next line gave 31 feet at 20 feet distance; the next line 47 feet at 15 feet distance; the next line 33 feet at 20 feet distance; and the next line 34 feet at 30 feet distance. All these figures indicate a slope exceeding 1 in 1, and in one case a slope exceeding 3 in 1. The following table gives the areas between the consecutive contour lines at intervals of 50 feet, with the percentages to the total area of the loch, the flat-bottomed character of the basin being indicated by the larger zone on the deeper side of the 100-feet contour than on the shallower side :—

Feet	Acres.	Per cent.
0 to 50	195	37
50 „ 100	89	17
100 „ 150	125	24
150 „ 200	70	13
Over 200	47	9
	526	100

Temperature Observations.—A series of temperatures taken at 3 p.m. on October 6, 1903, in the deepest part of the loch, gave the following results:—

Surface	49°·2 Fahr.
10 feet	48°·9 „
25 „	48°·6 „
50 „	48°·0 „
100 „	47°·0 „
150 „	45°·6 „
200 „	44°·8 „

The extreme range shown by these observations is only 4°·4 from surface to bottom, the fall of temperature being very gradual.

Loch an Laghair (see Plate II.).—Loch an Laghair lies a little over a mile to the north-east of Loch Affric, and is practically continuous with Loch Beinn a' Mheadhoin, for normally the two lochs stand at the same level, although an easterly gale sets up a strong current through the narrows at Blàr an Àth, in which a depth of 5 feet was observed. The loch trends in a north-east and south-west direction, and is nearly two-thirds of a mile in length. The maximum width exceeds a quarter of a mile towards the western end, whence the loch narrows gradually towards the eastern end. The superficial area of the loch is about 83 acres, and the area draining directly into it nearly 6 square miles, but since it receives the overflow from Loch Affric its total drainage area is about $52\frac{1}{2}$ square miles, an area over four hundred times greater than that of the loch. The deepest sounding in 100 feet was taken in the central part of the loch, but rather nearer to the north-east end. The volume of water is estimated at 135 million cubic feet, and the mean depth at $37\frac{1}{4}$ feet. The loch was surveyed on October 6, 1903; but the elevation of the lake-surface above the sea could not be determined by levelling, as there was no bench-mark near the loch. The level was estimated at about 703 feet above sea-level.

Loch an Laghair forms a simple basin, the shallower contours coinciding approximately with the outline of the loch, but approaching closer to the northern shore in the eastern half of the loch, where the off-shore slope is steepest. The western end is apparently being silted up. The 75-feet area is extremely small, for on each side of the deepest sounding in 100 feet, at a distance represented by twenty strokes of the oar, the depths were 66 and 64 feet respectively. A section across the loch at the position of the deepest sounding is shown

in cross-section E–F on the map, and a section along both Loch an Laghair and Loch Beinn a' Mheadhoin is shown in the longitudinal section A–B. The area of the lake-floor in Loch an Laghair covered by less than 50 feet of water is about 63 acres, or 76 per cent. of the total area of the loch. The temperature of the surface water at 3.30 p.m. on the date of the survey was 48°·0 Fahr., the air-temperature being 42°·0.

Loch Beinn a' Mheadhoin (see Plate II.).—Loch Beinn a' Mheadhoin (or Beinnavian or Beneveian) trends generally in a north-east and south-westerly direction, and is over $2\frac{1}{4}$ miles in length. The loch is fairly uniform in width, the two end portions being somewhat narrower than the central portion, which has a maximum breadth of nearly half a mile, the mean breadth of the entire loch exceeding a quarter of a mile. The superficial area of the loch is about 504 acres, or over three-quarters of a square mile, and the area of land draining directly into it is about $15\frac{1}{2}$ square miles; but since it receives the superfluent waters from Lochs Affric and an Laghair, the total drainage area is about 68 square miles. The maximum depth of 167 feet was observed in a central position, but nearer to the eastern than to the western end of the loch. The volume of water is estimated at 1435 millions of cubic feet, and the mean depth at over 65 feet. The loch was surveyed on October 6, 1903; but the elevation of the lake-surface above the sea could not be determined by levelling. The water in the loch was very high on the date of the survey, the level then being estimated at about 703 feet above sea-level, but the normal level is probably about 700 feet.

Loch Beinn a' Mheadhoin is rather complex in conformation, including as it does three deep basins separated by shallower water. Near the western end of the loch is a small basin having a maximum depth of 95 feet, and near the eastern end is a larger basin having a maximum depth of 117 feet, while the largest and deepest basin occupies the central portion. The two ridges separating these three basins may be due to the deposition of material brought down by the streams entering the loch at these places along the northern shore, of which the westerly stream (Amhainn a' Ghlinne Fhiadhaich) is the more important; the maximum depth observed on the western ridge was 69 feet, and on the eastern ridge 97 feet. The 25-feet and 50-feet contours are continuous from end to end of the loch, while the 75-feet contour is broken at the position of the western ridge, and the 100-feet contour is broken at the position of the eastern ridge. The eastern 100-feet basin is nearly half a mile in length, and the main 100-feet basin nearly $1\frac{1}{2}$ miles in length; within the last-mentioned basin is a long narrow 150-feet basin, based on soundings of 159, 167, and 154 feet, with an isolated sounding in 156 feet a quarter of a mile farther west. It

seems doubtful whether this isolated sounding may not be connected with the principal basin by deep water, and in that case the 150-feet basin would be nearly a mile in length. The deepest sounding in 167 feet was recorded about a mile from the eastern end of the loch, and about 1½ miles from the western end. The cross-section C–D, in this position, shows a steeper gradient off the northern than off the southern shore; but the soundings, as a whole, afford no evidence of any very steep slopes. The deeper part of the loch has quite a flat-bottomed character, as indicated by the figures in the following table, giving the areas between the consecutive contour-lines :—

Feet				Acres.		Per cent.
0 to 25	...	...	...	98	...	19·5
25 to 50	...	...	...	80	...	15·8
50 to 75	...	...	...	96	...	19·0
75 to 100	...	...	...	174	...	34·5
Over 100	...	...	...	56	...	11·2
				504		100·0

It will be observed that the largest zone is the one between 75 and 100 feet, and that the area of the lake-floor covered by less than 50 feet of water is about 178 acres, as compared with 270 acres covered by water between 50 and 100 feet in depth, or 35 per cent. as compared with 53 per cent. In most lakes the arrangement is the reverse of this, the areas between consecutive contour-lines drawn at equal intervals, usually decreasing with increase of depth. The temperature of the surface water at the east end on commencing the survey was 50°·0 Fahr., the temperature of the air being 42°·5, while later in the afternoon, towards the opposite end the surface temperature was 49°·5; but, an easterly gale having sprung up, it was found impossible to take serial temperatures beneath the surface.

Loch na Beinne Bàine (see Plate V.). - Loch na Beinne Bàine lies in Guisachan forest, about 4 miles to the south-east of Loch Beinn a' Mheadhoin, and 8 or 9 miles to the west of Invermoriston on Loch Ness. It is irregular in outline, trends in a north-north-east and south-south-westerly direction, and is nearly a mile in length, with a maximum breadth of nearly half a mile. The superficial area is about 154 acres, or a quarter of a square mile, and the area draining into it about 1½ square miles. The maximum depth of 67 feet was observed about a quarter of a mile from the southern end of the loch, midway between an island of stones and the eastern shore. The volume of water is estimated at 190 million cubic feet, and the mean depth at 28⅓ feet. The loch was surveyed on June 6, 1904, but the elevation of the lake-surface above the sea could not be determined; the height of the water at the sluice was about 2 feet, and at one time the loch appears to have been considerably higher.

Loch na Beinne Bàine forms a simple basin; the 25-feet contour coincides approximately with the outline of the loch, but is deflected at the position of the island of stones off the western shore towards the southern end, while the 50-feet basin, based on soundings of 67, 64, 54, and 52 feet, is contained in the southern half of the loch, and is about a quarter of a mile in length. The soundings indicate in one or two places slight undulations of the lake-floor, but as a rule the slope of the bottom is regular and gentle. The area covered by less than 25 feet of water is about 95 acres, or 62 per cent. of the total area.

Temperature Observations.—A series of temperatures taken in the deepest part of the loch gave the following results: –

Surface	60°·8 Fahr.
10 feet	60°·0 „
20 „	50°·5 „
40 „	47°·6 „
60 „	46°·5 „

These observations indicate an extreme range of temperature from surface to bottom amounting to 14°·3, there being a fall of 9°·5 between 10 and 20 feet, which is nearly equal to a fall in temperature of one degree per foot of depth. Reference has elsewhere been made to the large range and rapid fall of temperature observed in Lochs Monzievaird, Achilty, and Dubh,* and the temperatures here given from Loch na Beinne Bàine afford another instance for comparison.

Loch Lungard (see Plate V.)—Loch Lungard (or Longart, or Glasletter) lies at the head of Glen Cannich, about 5 miles to the north of Loch Affric. It trends east and west, and is $1\frac{1}{2}$ miles in length, with a maximum breadth towards the west end of one-third of a mile, whence the loch narrows gradually towards the east. The superficial area is about 216 acres, or one-third of a square mile, and the area draining into it is nearly 23 square miles. The maximum depth of 129 feet was observed in a central position, but towards the east end. The volume of water is estimated at 599 million cubic feet, and the mean depth at nearly 64 feet. The loch was surveyed on October 7, 1903, when the elevation of the lake-surface above the sea was found by levelling from bench-mark to be 761·3 feet, which is nearly identical with the level observed by the Ordnance Survey officers on October 14, 1867, viz. 761·2 feet. When surveyed the water was about its normal level, and in floods might rise about 3 feet.

Loch Lungard is extremely simple in conformation, the bottom sloping down on all sides towards the deepest part, not the slightest irregularity being indicated by the soundings, while the contour-lines coincide approximately with the outline of the loch. This is shown in

* See *Geogr. Journ.*, vol. 26, pp. 55, 56, July, 1905.

both the longitudinal section A–B and the cross-section C–D on the map. The 50-feet basin is 1½ miles, and the 100-feet basin rather under a mile, in length, and they are comparatively wide, so that the loch is of a flat-bottomed character, as is shown by the following table, giving the areas and percentages between the contour-lines :—

Feet.		Acres.		Per cent.
0 to 50	... ...	87	...	40
50 „ 100	... ...	81	...	38
Over 100	... ...	48	...	22
		216		100

Temperature Observations.—The following series of temperatures, taken at 2 p.m. on the date of the survey in the deepest part of the loch, indicates a range of only 1°·2 Fahr. throughout the body of water :—

Surface	...	49°·2 Fahr
25 feet	...	49°·0 „
50 „	...	48°·8 „
125 „	...	48°·0 „

Loch Mullardoch (see Plate III.).—Loch Mullardoch (or Mulardich, or Moyley) lies less than 2 miles to the east of Loch Lungard, and is practically continuous with Loch Sealbhag, there being a small expansion of the river between them called Loch Ath a' Bhàn, which was not sounded. Loch Mullardoch trends generally in an east and westerly direction, and is somewhat irregular in outline, with a slight bend in the central portion. It exceeds 4 miles in length, and is pretty uniform in width, the maximum breadth being less than half a mile, and the mean breadth over a quarter of a mile. Its waters cover an area of about 756 acres, or considerably more than a square mile, and the area draining directly into it is about 27½ square miles; but since it receives the outflow from Loch Lungard its total drainage area exceeds 50 square miles. The maximum depth of 197 feet was observed in the eastern portion of the loch, about a mile and a half from the east end. The volume of water is estimated at 2553 millions of cubic feet, and the mean depth at 77½ feet. The loch was surveyed on October 7, 1903, but the elevation above the sea was not determined; when levelled by the Ordnance Survey officers on November 29, 1866, the elevation of the lake-surface was found to be 704·9 feet above sea-level. On the date of the survey the water was about a foot above the normal level, and two days previously it had been 3 feet higher.

Loch Mullardoch is divided into two deep basins by a shoaling of the water in its central portion, where there is a constriction and bend in the outline, the maximum depth in the western basin being 150 feet, and in the eastern basin 197 feet, the depth on the shoaling being 80 feet. A section across the deepest part of the western basin is shown in

cross-section C–D, and one across the deepest part of the eastern basin in cross-section E–F, on the map, and a section along the centre of the loch from end to end is shown in the longitudinal section A–B at the foot of the map. This last-mentioned section brings out the central shoaling referred to, which is apparently traceable to the influence of the streams entering on both sides of the loch at this place, and principally of the Allt Taige, at the mouth of which, on the northern shore, is a considerable delta. The 50-feet contour is continuous, and encloses a basin nearly 4 miles in length. The western 100-feet basin exceeds half a mile in length, separated by an interval of over half a mile from the eastern 100-feet basin, which is one and a half miles in length, and includes a 150-feet basin over a mile in length. All the cross-lines of soundings show a regular bottom, the water deepening gradually from the shore towards the centre, with a steep off-shore slope in some places, as, for instance, along the southern shore off Creag Dubh, where a sounding in 24 feet was taken about 20 feet from shore, and off Creag a' Bhaca, at the deepest part of the loch, where a sounding in 94 feet was taken about 100 feet from shore. The following table gives the approximate areas between the consecutive contour-lines at intervals of 50 feet, and the percentages to the total area of the loch, and indicates the flat-bottomed character of the basin, the comparatively large area of the lake-floor covered by more than 150 feet of water being noteworthy :—

Feet.	Acres.	Per cent.
0 to 50	298	39
50 " 100	228	30
100 " 150	121	16
Over 150	109	15
	756	100

Temperature Observations.—The following series of temperatures, taken at 4.30 p.m. on the date of the survey in the western basin, shows that the water was nearly uniform in temperature, the extreme range from surface to bottom being only 1° Fahr., the readings down to a depth of 50 feet being identical :—

Surface	50°·0 Fahr.
10 feet	50°·0 "
25 "	50°·0 "
50 "	50°·0 "
100 "	49°·5 "
150 "	49°·0 "

Loch Sealbhag (see Plate III.).—Loch Sealbhag lies to the east of, and is, as already stated, practically a continuation of Loch Mullardoch. It trends in a north-east and south-westerly direction, and is two-thirds of a mile in length, with a maximum breadth towards the west end of nearly a quarter of a mile, whence it narrows gradually towards the

north-east. Its waters cover an area of about 68 acres, and it drains directly an area of $3\frac{1}{2}$ square miles, but since it receives the outflow from Lochs Lungard and Mullardoch, its total drainage area is nearly 54 square miles an area nearly five hundred times greater than that of the loch. The maximum depth of 56 feet was observed in the widest part of the loch towards the western end, and comparatively near the southern shore. The volume of water is estimated at 61 million cubic feet, and the mean depth at over $20\frac{1}{2}$ feet. The loch was surveyed on October 5, 1903, but the elevation above the sea could not be determined

The wide western portion of Loch Sealbhag includes a deep basin exceeding 30 feet in depth, which approaches comparatively close to the western end, and is over a quarter of a mile in length. To the north east of this basin the bottom rises, and falls again on approaching the outfall to a depth of 31 feet, the depth on the rise being 16 feet. The area of the lake-floor covered by less than 20 feet of water is about 39 acres, or 57 per cent. of the total area. The temperature of the surface water on the date of the survey was 50·5 Fahr.

Loch Calavie (see Plate V.).--Loch Calavie (or Calvie) lies about 6 miles to the north-west of Loch Lungard, and only 7 miles from the head of Loch Carron on the west coast of Scotland, at a high elevation among the mountains, the lower slopes of which are covered with peat. The loch trends in a north-west and south-easterly direction, and is considerably over a mile in length, with a maximum width towards the western end exceeding one-third of a mile, whence the breadth gradually decreases on approaching the eastern end. The superficial area is about 167 acres, or a quarter of a square mile, and the area draining into it nearly $2\frac{1}{2}$ square miles. The maximum depth of 84 feet was observed in a central position, but rather nearer the western than the eastern end The volume of water is estimated at 276 million cubic feet, and the mean depth at 38 feet. The loch was surveyed on October 19, 1901, when the elevation was found by levelling from bench-mark to be 1128·35 feet above the sea—a little lower than the elevation as determined by the Ordnance Survey officers on August 14, 1866, viz. 1128·5 feet above sea-level.

Loch Calavie is perfectly simple in conformation, the contour-lines coinciding approximately with the shore-line, though in each case they approach nearer to the western than to the eastern end of the loch, so that the average slope is steeper towards the head of the loch. This is shown in the longitudinal section A-B on the map. The 25-feet basin is nearly a mile, and the 50-feet basin three-quarters of a mile, in length. The soundings give no indication of any steep off-shore slopes, and the average slope between the 25-feet and 50-feet contours

is less steep than in shallower water, as indicated in the following table by the larger area beyond the 25-feet line :—

Feet.		Acres		Per cent.
0 to 25	... ...	55	...	33
25 " 50	... ...	62	...	37
50 " 75	... ...	39	...	24
Over 75	... ...	11	...	6
		167		100

Temperature Observations.—The following series of temperatures taken in the deepest part of the loch shows that on the date of the survey the whole body of water was practically uniform in temperature, the extreme range being less than 1° Fahr. :—

Surface	... ...	47°·0 Fahr.
40 feet	... ...	46°·3 "
75 "	... ...	46°·2 "

Loch an Tachdaidh (see Plate V.).—Loch an Tachdaidh lies about 2 miles to the east of Loch Calavie, and is almost continuous with Loch an Gead, the stream between them being a very short one, and the difference in level only 1½ feet. The term Gedd Lochs is applied to the connected series, consisting of Loch an Gead, Loch an Tachdaidh, and the neighbouring little Loch an Gobhlach, which was not sounded. Loch an Tachdaidh is irregular in outline, trends in a north-east and south-westerly direction, and is nearly two-thirds of a mile in length, with a maximum breadth exceeding one-third of a mile. Its waters cover an area of about 92 acres, and it drains directly an area exceeding 4 square miles, but since it receives the overflow from Loch Calavie, its total drainage area is over 6½ square miles. The maximum depth of 62 feet was observed in the centre of the north-eastern portion of the loch, near a heap of stones, showing above the surface of the water. The volume of water is estimated at 72 million cubic feet, and the mean depth at 18 feet. The loch was surveyed on October 21, 1904; the elevation could not be determined by levelling, but was estimated at about 831·5 feet above the sea.

Loch an Tachdaidh is irregular in conformation as well as in outline, and, besides the island of stones already mentioned, includes four small unnamed islands, the largest of which occupies a central position; the south-western portion is shallow and filled with weeds. The contour-lines are sinuous in character, the deepest part lying between the largest island and the heap of stones, where three soundings exceeding 50 feet in depth were taken. To the south of the largest island, and towards the eastern shore, a sounding in 25 feet was recorded, surrounded by shallower water. The area of the lake-floor covered by less than 25 feet of water is about 74 acres, or 81 per cent. of the total area. The following series of temperatures taken in the position of

the deepest sounding shows a range of only 1°·2 Fahr. throughout the body of water, the deeper layers being uniform in temperature:—

Surface	46°·2 Fahr
30 feet	45°·0 „
60 „	45°·0 „

An Gead Loch (see Plate V.).—An Gead loch lies to the north-east of Loch an Tachdaidh, and trends in a similar direction, but is more regular in outline and more uniform in width. An Gead loch is nearly 1¼ miles in length, with a maximum width towards the south-west end of a quarter of a mile. The superficial area is about 110 acres, and the area draining directly into it is about 2½ square miles, but since it receives the outflow from Lochs Calavie and an Tachdaidh, the total drainage area exceeds 9 square miles. The maximum depth of 30 feet was observed towards the north-eastern end of the loch. The volume of water is estimated at 54 million cubic feet, and the mean depth at 11¼ feet. The loch was surveyed on October 21, 1904, and the elevation was estimated at about 830 feet above sea-level. The bottom of an Gead loch is irregular and stony, so much so that in the deeper part no mud could be got, while the shallow western portion is covered with sand. Though irregular, the basin has a flat-bottomed character, for the majority of the soundings were taken in depths exceeding 10 feet, and only three soundings in depths exceeding 20 feet. The area of the lake-floor covered by more than 10 feet of water is about 62 acres, or 56 per cent. of the total area. The temperature of the water was nearly uniform on the date of the survey, a reading at the surface giving 46°·7 Fahr., and a reading at 25 feet 46°·0.

Loch Monar (see Plate IV.).—Loch Monar lies at the head of Glen Strath Farrar, little more than a mile to the north-east of an Gead loch, and is one of the most important lochs in the Beauly basin. In length and in superficial area it is slightly inferior to Loch Mullardoch, but it is the deepest of the series, and contains the largest volume of water. The general trend of Loch Monar is east and west, but with a slight sinuosity in the outline, the length exceeding 4 miles. The width varies considerably, the maximum breadth of nearly half a mile occurring near the west end, the mean breadth of the entire loch exceeding a quarter of a mile. The waters of the loch cover an area of about 750 acres, or over one square mile, and the area draining directly into it is about 41 square miles, but since it receives the overflow from Lochs Calavie, an Tachdaidh, and an Gead, the total drainage area is about 50 square miles. The maximum depth of 260 feet was observed much nearer the eastern than the western end. The volume of water is estimated at 3213 millions of cubic feet, and the mean depth at 98⅓ feet. The loch was surveyed on October 10, 1903, when the elevation of the lake-surface above the sea was found

to be 663·9 feet; when levelled by the officers of the Ordnance Survey on June 20, 1866, the elevation was 662·8 feet above sea-level. At the time of the survey the water was about its normal level, and might rise to the extent of several feet.

Loch Monar is quite simple in conformation, all the contour-lines enclosing continuous areas, and the cross-lines of soundings indicating a regularly sloping bottom from the shores out towards the centre of the loch. The longitudinal section, A–B on the map, along the centre of the loch from end to end shows slight undulations of the lake-floor, the shallowings coinciding with constrictions in the outline. The contour-lines all approach nearer to the eastern than to the western end of the loch, showing a steeper slope in an easterly direction from the deepest sounding, which was taken less than a mile from the east end, or one-fourth of the distance from one end to the other. The off-shore slope is in places very steep, especially along the southern shore at the deepest part of the loch, where near the centre of the loch a sounding in 104 feet was taken about 120 feet from shore; a little further east another sounding in 50 feet was taken about 50 feet from shore; still farther east a sounding in 148 feet was taken about 120 feet from shore; and still further east a sounding in 87 feet about 60 feet from shore. The last-mentioned sounding, which gives a slope of 29 in 20, was taken on the cross-line immediately to the east of the deepest sounding, and the steepest gradient observed off the northern shore was at the opposite end of the same line, where a sounding in 54 feet was taken at about 60 feet from shore. The cross-section C–D on the map is taken at the position of the deepest sounding, and shows a gentle off-shore slope, succeeded by a steeper slope on proceeding into deep water, the deeper part of the loch being of a flat-bottomed character. The area enclosed by the 50-feet contour is nearly $3\frac{1}{2}$ miles in length, being distant from the west end nearly three-quarters of a mile, and extending into the narrow part at the east end off Creag Ghràda; in the expansion of the out-flowing river, opposite Creag Dhubh, a depth of 64 feet was observed. The 100-feet basin is 3 miles, the 150-feet basin $2\frac{1}{2}$ miles, and the 200-feet basin over one mile, in length. The approximate areas between the consecutive contour-lines drawn in at equal intervals, and the percentages to the total area of the loch, are given in the following table, from which it will be noticed that the area of the zone between 150 and 200 feet is larger than that of the two preceding shallower zones :—

Feet.	Acres.	Per cent.
0 to 50	293	39
50 „ 100	134	18
100 „ 150	99	13
150 „ 200	138	18
Over 200	86	12
	750	100

Temperature Observations.—The following series of temperatures, taken in the deepest part of the loch at 4 p.m. on the date of the survey, shows that the whole body of water varied little in temperature, being, in fact, uniform in temperature down to 100 feet, the extreme range amounting to only 1°·2 Fahr.:—

Surface	49°·5 Fahr.
10 feet	49°·5 „
25 „	49°·5 „
50 „	49°·5 „
100 „	49°·4 „
150 „	49°·0 „
170 „	48°·5 „
200 „	48°·3 „

Loch a' Mhuilinn (see Plate V.).—Loch a' Mhuilinn (or Moilie) is a small irregular loch lying about 5 miles to the east of Loch Monar. A terrace of gravel surrounds the loch, except on the northern shore, where the hill An Carnach rises steeply from the lake-shore. There is a large island named Eilean a' Mhuilinn near the east end, and two smaller islands at the mouth of the inflowing river at the west end. The loch trends in an east-north-east and west-south-westerly direction, and is nearly a mile in length, with a maximum breadth in the centre exceeding one-third of a mile, whence it narrows towards the two ends. The superficial area is about 100 acres, and the area of land draining directly into it is about 37¾ square miles, but since it receives the overflow from Lochs Monar, an Gead, an Tachdaidh, and Calavie, its total drainage area is nearly 88 square miles—an area 550 times greater than that of the loch. The maximum depth of 94 feet was observed in the wide part of the loch towards the northern shore. The volume of water is estimated at 150 million cubic feet, and the mean depth at over 34 feet. The loch was surveyed on October 12, 1903, when the elevation was determined by levelling from bench-mark as being 417·65 feet above the sea; when visited by the Ordnance Survey officers on June 1, 1866, the elevation was found to be 417·5 feet above sea-level. A drift-mark was observed 5 feet above the surface of the water on the date of the survey, when the level was about its normal.

Loch a' Mhuilinn consists of a deep central basin, with two small subsidiary shallow basins at the two ends, as shown in the longitudinal section on the map. Towards the west end, immediately to the north of the island at the mouth of the inflowing river, a depth of 25 feet was recorded, separated from the main basin by a rise of the bottom, on which a maximum depth of 12 feet was observed. Towards the east end, between Eilean a' Mhuilinn and the mouth of the outflowing river, a depth of 24 feet was recorded, separated from the main basin by a depth of 3 feet in the narrows between the island and the northern shore. In the main deep basin the contour-lines are continuous and

the bottom regular, seven soundings in depths exceeding 80 feet having been recorded to the west and south-west of Eilean a' Mhuilinn, two of them in depths exceeding 90 feet. The area of the lake-floor covered by less than 50 feet of water is about 72 acres. The following series of temperatures taken in the deepest part of the loch shows that the body of water was nearly uniform in temperature on the date of the survey, the extreme range observed being less than 1° Fahr.:—

Surface	47°·2 Fahr.
10 feet	47°·0 „
25 „	46°·8 „
50 „	46°·6 „
90 „	46°·4 „

Loch Bunacharan (see Plate V.).—Loch Bunacharan (or Banchron) lies less than a mile to the east of Loch a' Mhuilinn and about 6 miles east of Loch Monar, and is the final one of the series of lochs in Glen Strath Farrar. The shores are mostly of gravelly *débris*, forming terraces about 20 feet high, which are best seen along the south shore; the surrounding hills are high and rugged, and well wooded. The loch trends east-north-east and west-south-west, and is 1¼ miles in length, with a maximum width of nearly one-third of a mile, the superficial area being about 157 acres, or a quarter of a square mile. The area draining directly into Loch Bunacharan is only about 4 square miles, but it receives the overflow from Lochs Calavie, an Tachdaidh, an Gead, Monar, and a' Mhuilinn, and its total drainage area is therefore a very large one—about 92 square miles. The maximum depth of 113 feet was observed towards the east end of the loch—less than half a mile from the east end and more than three-quarters of a mile from the west end. The volume of water is estimated at about 343 million cubic feet, and the mean depth at over 50 feet. The loch was surveyed on October 12, 1903, when the elevation of the lake-surface above the sea was found by levelling from bench-mark to be 366·15 feet; when levelled by the officers of the Ordnance Survey on June 9, 1866, the elevation was 366·5 feet above sea-level. On the date of the survey the water was about its normal level, and a recent drift-mark was observed 9 feet above the surface of the water, while an older drift-mark was 11 feet above the water-surface.

Loch Bunacharan is irregular in conformation, the lake-floor in the deeper part of the loch rising and falling in a series of undulations. The 25-feet and 50-feet contours are continuous from end to end of the loch, and coincide approximately with the shore-line. The 75-feet contour, however, encloses three distinct basins separated from each other by shallower water, viz. (1) a very small basin based on a sounding in 83 feet about 300 yards from the western end; (2) a larger basin a quarter of a mile in length, and trending almost north and south, *i.e.* transversely across the loch, based on soundings in 78, 82,

SUMMARY TABLE.

Giving Details concerning the Lochs described in this Paper.

Loch.	Height above sea. Feet.	Number of soundings.	Length in miles.	Breadth in miles. Max.	Breadth in miles. Mean.	Mean breadth per cent. of length.	Depth. Max. Feet.	Depth. Mean Feet.	Depth. Mean per cent. of max	Ratio of depth to length. Max.	Ratio of depth to length. Mean.	Volume in million cubic feet.	Area in square miles.	Drainage area. Total in square miles.	Drainage area. Ratio to area of loch.
Affric	747·0	119	3·20	0·46	0·26	8·1	221	93·64	42·4	76	181	2,146	0·82	46·66	56·9
an Laghair	—	23	0·62	0·28	0·21	33·8	100	37·23	37·2	33	88	135	0·13	52·50	403·9
Beinn a' Mheadhoin ...	—	73	2·64	0·44	0·30	11·3	167	65·36	39·1	83	213	1,435	0·79	67·98	86·0
na Beinne Bàine ...	—	75	0·97	0·40	0·25	25·8	67	28·33	42·3	76	181	190	0·24	1·48	6·2
Lungard	761·3	55	1·44	0·34	0·23	16·0	129	63·68	49·4	59	119	599	0·34	22·84	67·2
Mullardoch	—	111	4·16	0·46	0·28	6·7	197	77·52	39·4	111	283	2,553	1·18	50·37	42·7
Sealbhag	—	33	0·64	0·22	0·17	26·6	56	20·66	36·9	60	164	61	0·11	53·86	489·6
Calavie	1128·35	58	1·12	0·36	0·23	20·6	84	37·91	45·1	70	156	276	0·26	2·31	8·9
an Tachdaidh	—	38	0·62	0·37	0·23	37·1	62	17·88	28·8	53	183	72	0·14	6·60	47·1
an Gead	—	52	1·21	0·27	0·14	11·6	30	11·29	37·6	213	566	54	0·17	9·12	53·7
Monar	663·9	117	4·10	0·42	0·29	7·0	260	98·33	37·8	83	220	3,213	1·17	50·06	42·8
a' Mhuilinn	417·65	43	0·84	0·36	0·19	22·6	94	34·15	36·3	47	130	150	0·16	87·82	548·8
Bunacharan	366·15	44	1·26	0·30	0·19	15·1	113	50·11	44·3	59	133	343	0·25	91·94	367·7
		841										11,227	5·76	215·26 *	37·4

* The drainage areas of Lochs Affric and an Laghair are included in that of Loch Beinn a' Mheadhoin; those of Lochs Lungard and Mullardoch in that of Loch Sealbhag; and those of Lochs Calavie, an Tachdaidh, an Gead, Monar, and a' Mhuilinn in that of Loch Bunacharan.

and 88 feet, situated about one-third of a mile from the western end; and (3) the largest and deepest basin, one-third of a mile in length, approaching to within a quarter of a mile from the eastern end, and enclosing a small basin exceeding 100 feet in depth, based on soundings in 105, 111, and 113 feet. Between the second and third basins above noted there is a rise of the lake-floor near the middle of the loch, covered by 43 feet of water, surrounded on all sides by deeper water. These inequalities are indicated to some extent in the longitudinal section A–B on the map, taken along the axis of maximum depth, but most of the cross-lines of soundings show a regular bottom, as shown in cross-section C–D, taken at the position of the deepest sounding. The slope of the bottom seems to be gentle on the whole, the steepest gradient observed being off the northern shore towards the west end, where a sounding in 48 feet was taken about 50 feet from shore. The area of the lake-floor covered by less than 50 feet of water is about 80 acres, or 51 per cent. of the total area. The following series of temperatures, taken in the deepest part of the loch, show that the whole body of water was practically uniform in temperature:—

Surface ...	48°·2	Fahr.
25 feet ...	48°·2	„
50 „ ...	48°·0	„
75 „ ...	48°·0	„
90 „ ...	48°·0	„
110 „ ...	47°·9	„

The particulars regarding the lochs dealt with in this paper are collected together in the opposite table for convenience of reference and comparison.

From this table it will be seen that in the thirteen lochs under consideration, which cover an area of 5¾ square miles, about 850 soundings were taken, or an average of 146 soundings per square mile of surface. The aggregate volume of water contained in the lochs is estimated at 11,230 millions of cubic feet, and the area draining into them is over 215 square miles, or thirty-seven times the area of the lochs.

GEOLOGICAL NOTES ON THE LOCHS WITHIN THE BASIN OF THE FARRAR.

By B. N. PEACH, LL.D., F.R.S., and J. HORNE, LL.D., F.R.S.

The mapping of the western part of the Beauly basin by the Geological Survey has only been carried southwards to the watershed between Glen Strath Farrar and Glen Cannich, and hence the following notes are confined to the lakes lying within the basin of the Farrar. This area is entirely occupied by the metamorphic rocks of the Highlands, which have been arranged in two divisions: (1) An older series, which has been correlated with the Lewisian or Archæan gneiss of the West Highlands; and (2) a group of crystalline schists, termed the Moine series by the

Geological Survey, which are regarded as altered sediments, and are supposed to rest unconformably on the older Lewisian gneiss.

The members of the older series comprise hornblendic and biotite gneisses, and ultrabasic masses, together with crystalline limestone, graphite schists and eclogites, which resemble the rocks of Lewisian age in the neighbourhood of Glenelg. The Moine series includes two prominent subdivisions: (1) flaggy and massive quartz-biotite-granulites; and (2) muscovite-biotite schists, the latter probably representing an argillaceous phase of sedimentation. In the basin of the Farrar the general strike of the crystalline schists, with the exception of local variations, is north-north-east and south-south-west, or north-east and south-west - that is to say, obliquely across the course of the main valley.

The basin of the Farrar is traversed by a powerful dislocation, which passes from the Conon valley in a south-west direction by Gleann Chorainn and the head of the river Orrin, thence across Loch Monar to the south-west shoulder of the Riabhachan. It forms a well-marked feature, and is accompanied by much brecciation and staining of the rocks, as may be seen along its course to the north-east of Loch Monar. At certain localities, parallel or branching faults, presumably connected with the main dislocation, are met with, which modify to some extent the surface features.

During the period of confluent glaciers, the ice radiating from the mass of high ground south of Loch Monar, embracing Sgurr na Lapaich, 3773 feet, and An Riabhachan, 3696 feet, and from the heights between that lake and Gleann Fhiodhaig to the north, flowed eastwards down Glen Strath Farrar, and streamed northwards through some of the passes towards the Orrin and Glen Fhiodhaig, and westwards in the direction of the valley of the Ling. At a later stage it escaped only by Strath Farrar. The diverging movement through the various passes is indicated partly by ice-markings, and partly by the disposition of the moraines.

Loch Monar is a true rock basin carved mainly out of the crystalline schists of the Moine series, modified by the movements accompanying the Strath Conon fault and its branches, to which reference has already been made. The lip of the basin is now about half a mile below the present outlet of the lake, the intervening area being silted up by the alluvium brought down by Allt Coire na Faochaige—a tributary which joins the main stream opposite Monar Lodge. The rocks forming the barrier of the lake are well seen in the gorge of the Garbh-uisge, where they consist of massive siliceous Moine schists, intensely plicated along vertical axes trending north-east and south-west.

In the narrow part of the lake immediately above Monar Lodge there is a small subsidiary basin, which may be accounted for by inequalities in the hardness of the rocks, and by the irregular distribution of the drift on the west side of the loch. The deep part of the main basin coincides with the belt of crushed strata accompanying the Strath Conon fault that crosses the lake near Lub-an-Inbhir and the parallel dislocation above Creag na h-Iolaire. A third fault, trending east and west, enters the loch at the mouth of Allt nan Uan, which has produced considerable brecciation of the rocks.

The shallow bar near the head of the loch is due to a spit of sand, brought down partly by Allt Riabhachan and partly by the stream at Pait, which has been distributed by the action of the waves. The long stretch of alluvium along Amhainn-an t-Sratha Mhòir indicates that the lake has been silted up for about a mile above its present western limit.

Loch an Tachdaidh and An Gead Loch.—These lochs lie in the bottom of the valley drained by the Garbh-uisge at Pait, which flows into Loch Monar, and are entirely surrounded by drift deposits of the later glaciation. All the small

projections into these lakes are due to moraine heaps, arranged in such a way as to suggest that they are probably the terminal moraines of a lobe of ice that moved westwards towards the basin of the river Ling.

Loch Calavie lies in one of the passes through which the ice escaped westwards from the Monar area during the period of confluent glaciers. Though immediately surrounded by moraines and peat, it is evidently in part a rock basin, as the rocky barrier formed of muscovite-biotite gneiss appears in the stream not far below the outlet of the lake. The deepest sounding is 84 feet.

Loch Bunacharan and Loch a' Mhuilinn.—These lakes are situated in the valley of the Farrar about midway between Loch Monar and Struy. Their long axes seem to coincide generally with the strike of the crystalline schists. In the case of the former lake, its height above sea-level is 366 feet, its greatest depth 113 feet, and the position of the rocky barrier exposed in the stream about one-third of a mile below the outlet is about 360 feet. The surface level of Loch a' Mhuilinn is 417 feet, and the deepest sounding is 94 feet, and as it discharges over solid rock, it is evidently a small rock basin. There is a high terrace round Loch a' Mhuilinn and on the south side of Loch Bunacharan at a level of 440 feet.

NOTES ON THE BIOLOGY OF THE LOCHS OF THE BEAULY BASIN.

By JAMES MURRAY.

THE lochs of Beauly valley were surveyed in late autumn, during very severe weather, unfavourable for the study of biology. The lochs in Glen Affric were visited in a time of heavy floods, which raised the lochs several feet while we were working at them. Though the tow-nets were used, there was almost nothing got in them. The lochs appeared to be flushed and washed out by the spate, or else the animals had gone down to quieter water.

Throughout the rest of the basin there was great uniformity, the ordinary universal limnetic Crustacea and Rotifers alone being present, with little call for remark. There was an entire absence of all the northern species of *Diaptomus*, and, although Desmids were fairly abundant in most of the lochs, there were none of the western species.

The few species which only occurred in some of the lochs are noted below. These are also generally distributed in summer, their scarcity in these lochs being due to the late season at which they were visited.

Daphnia.—In all the lochs where *Daphnia* occurred, it was as the variety *galeata*, a large form with the head angled.

Holopedium gibberum.—Only in Lochs Calavie and an Tachdaidh.

Leptodora kindtii.—Only in Loch Monar.

Polyphemus pediculus.—An Gead loch.

Cyclops strenuus.—Present in most of the lochs. The *Cyclops* in Loch Calavie were red-spotted.

Diaphanosoma brachyurum.—Found in four lochs—Tachdaidh, Bunacharan, Mullardoch, and Lungard.

Floscularia pelagica.—Loch Monar.

Conochilus.—Both species, *C. unicornis* (the common lake species) and *C. volvox*, were present in Loch Monar.

Sponge.—A fresh-water sponge, species not determined, came up attached to the sounding-rod, from depths of 6 or 8 feet, in Loch a' Mhuilinn. The pieces were long, finger-shaped.

THE NOMENCLATURE OF THE NORTH AMERICAN CORDILLERA BETWEEN THE 47TH AND 53RD PARALLELS OF LATITUDE.*

By REGINALD A. DALY, Ottawa, Canada.

Introduction and Outline.—In point of area, if not as certainly in point of total volume above sea, the western mountains of North America constitute by far the greatest system of the Earth. This vast region has always been very sparsely inhabited. In the orographic features it is generally complicated, often to the uttermost. Its exploration is only well begun. There are thus excellent reasons why the mountain units of this region are so inadequately named and systematized in geographical works, whether issued as official Government reports, as educational text-books or atlases, or as popular records of travel. Yet, whether he will or no, the explorer responsible for a report on any part of this region must confront the question of names. He returns from his rugged field, and, to tell of his findings, must use common nouns to indicate what kinds of land-relief he has found, and proper names to aid in individualizing and locating those reliefs in the huge backbone of the continent.

This duty has fallen to the writer in the task of reporting on the geology of the mountains crossed by the 49th parallel boundary between Canada and the United States. Though the same transmontane section has been described by the geologists attached to the 1857–61 commission, though it occurs along the most thickly settled part of British Columbia, and though it is nowhere very far from the lines of two transcontinental railroads, a complete and systematic grouping of the mountains on the boundary has never been made. The difficulty of supplying the lack was felt by the writer in the first of the five seasons devoted to the geology of the boundary, but the difficulty was more fully realized as the dire confusion of the nomenclature already in vogue became apparent.

It is manifest that any attempt to develop a constructive view of the boundary mountains should be founded as far as possible upon established units already understood and named. The literature has, therefore, been carefully searched to furnish this required foundation. The result has shown a truly surprising variety of usages in names and in concepts of the topography. The course of compilation inevitably led to the study of the nomenclature of western ranges even far away from the 49th parallel of latitude. Examples of the differences of usage are recorded in the first part of the following paper. The record may serve in some degree to illustrate the need of a

* Published by permission of the Canadian Commissioner, International Boundary Surveys.

consistent scheme of nomenclature, possibly to suggest partial grounds on which uniformity may some day be established.

The second part of this paper is concerned with a brief account of the nomenclature that seems most appropriate for the ranges crossed by the international boundary.

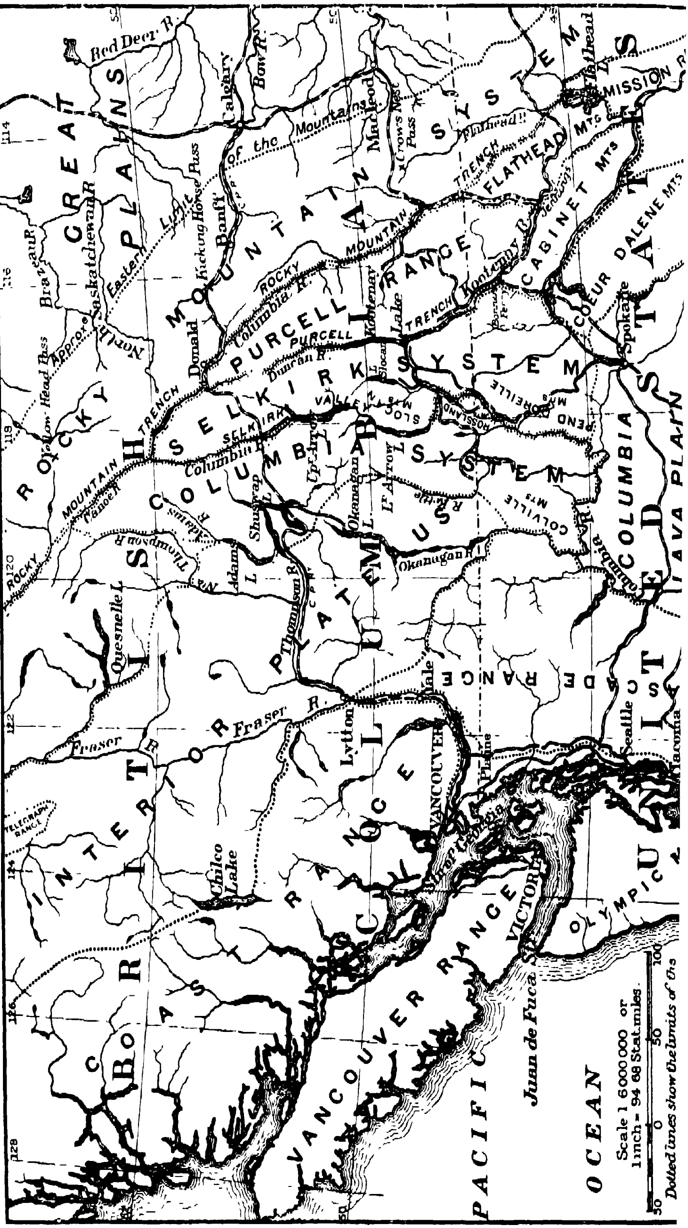
Different Nomenclatures in Use.—The search for the variations of nomenclature was made both among authorities responsible on the ground of priority and among authorities influential as standard compilers from original sources. For the present purpose of indicating the lack of uniformity and the confusion into which the great mass of the people may be led by consulting existing works of reference, it is not sufficient to record names found only in Government map or careful scientific monograph. Perhaps more important still in this connection is the record to be made from standard atlases, from school geographies, and from standard influential guide-books. In reality, it has required the examination of but a very limited number of each kind of authoritative works to point the moral. With few exceptions the only works consulted were printed in the English language.

The Diverse Naming of the Western Mountain Region as a Whole.—The question of the best general title for the western mountains may be considered as trite by those who do not feel the immediate need of its solution in their professional work. The writer by no means believes it to be trite, as he now completely realizes the wide latitude in naming among the recent influential publications dealing with North American geography. It is scarcely to the credit of our geographical societies and alpine clubs that they will publish at length the statement of one traveller that he found mosquitoes in Newfoundland, of another that his hotel accommodation in Manila was bad, and leave undiscussed the suggestive paper of Prof. Russell and his correspondents on the names of the larger geographical features of North America.* There would be no advantage to the European geographers if the Alps masqueraded under a dozen different general titles dependent on the personal tastes of individual writers on those mountains.

It is well known that one of the first designations of the entire mountain group lying between the Pacific and the Great Plains was due to Humboldt. His "Cordilleras of the Andes" extended from Cape Horn to the mouth of the Mackenzie river. Humboldt occasionally used the singular form "Cordillera of the Andes" for the same concept. In view of the general restriction of the term "Andes" to the mountains of South America, Whitney, in 1868, proposed that the name "Cordilleras," with variants, "Cordilleran System" and "Cordilleran Region," be retained to designate the North American equivalent of the Andes.

* *Bull Geog. Society of Philadelphia*, 1899, vol. 2, p. 55.

Map to illustrate the paper on
the Nomenclature of a part of the
NORTH AMERICAN CORDILLERA
By REGINALD A. DALY.



This name was adopted in the United States census reports for 1870 and 1880, and by a great number of expert geologists and geographers since 1868. In process of time, however, the singular form, "Cordillera" and variants, became used in the same sense. In one of these forms the Humboldt root word with Whitney's definition has entered many atlases. It appears on numberless pages of high-class Government reports, geographical, geological, and natural history memoirs, and of such works as Baedeker's 'Guide-book to the United States,' Stanford's 'Compendium of Geography,' etc.

The time-honoured, erroneous, similarly inclusive name "Rocky Mountains," with variants, "Rocky Mountain System," "Rocky Mountain Belt," etc., has, however, held the dominant place in the popular usage. Its inappropriateness for the heavily wooded Canadian mountains is abundantly evident. For the United States, Clarence King wrote a generation ago—

"The greatest looseness prevails in regard to the nomenclature of all the general divisions of the western mountains. For the very system itself there is as yet only a partial acceptance of that general name Cordilleras, which Humboldt applied to the whole series of chains that border the Pacific front of the two Americas. In current literature, geology being no exception, there is an unfortunate tendency to apply the name Rocky mountains to the system at large. So loose and meaningless a name is bad enough when restricted to its legitimate region, the eastern bordering chain of the system, but when spread westward over the Great Basin and the Sierra Nevada, it is simply abominable." *

The following table summarizes the above-mentioned variants along with others more recently introduced, and still other general names now only of historical interest. The names of prominent authorities and the leading dates when they have published the respective titles are also entered in the table. The authority for some of the older names is Whitney's work on the United States, published in Boston, 1889.

Mountains of the Bright Stones	General use, end of eighteenth century.
Shining Mountains	Morse, 'Universal Geography,' 1802.
Stoney or Stony Mountains	Arrowsmith, 1795; President Jefferson.
Columbians (*sic*) Mountains	Tardieu, 1820.
Chippewayan Mountains	Hinton, 1834.
The Cordilleras of the Andes (in part)	Humboldt, 1808, etc.
The Cordillera of the Andes (in part)	Humboldt, 1808, etc.

* 'U.S. Geol. Exploration, 40th Parallel, Systematic Geology, 1878,' p. 5.

The Cordilleras	Whitney, 1868; many authors since.
The Cordillera	G. M. Dawson, 1884, etc.; Gannett, 1898; Rand-McNally, 1905.
The Western Cordillera of North America	J. D. Dana, 1874, 1880.
The Cordilleras of North America	Hayden, 1883; Leconte, 1892, etc.
The Cordilleran Region	Whitney, 1868, etc.; Hayden, 1883; Shaler, 1891.
The Cordilleran System	Whitney, 1868, etc.; King, 1878; Baedeker, 1893.
The Cordillera System	Hayden, 1883.
The Cordillera Belt	G. M. Dawson, 1879, etc.; Rand-McNally, 1902.
The Pacific Cordillera	Russell, 1899, 1904.
The Cordilleran Plateau	Hayden, 1883.
The Cordillera of the Rocky Mountains	J. D. Dana, 1895.
The Rocky Mountain System	Leconte, 1892, etc.; Heilprin, 1899; many others.
The Rocky Mountain Region	Powell, 1875, etc.; G. M. Dawson, 1890; Gannett, 1899.
The Rocky Mountain Belt	Rand-McNally, 1902.
The Rocky Mountains	Lewis and Clarke; popular.
The Pacific Mountains	Russell, 1899, 1904; Powell, 1899.
The Western Highland	Baedeker, 1893; Keith Johnston Atlas, 1896; Davis, 1899.
The Rocky Mountain Highland	Frye, 1895, 1904.
The Western Plateau	English Imperial Atlas, 1892.

In most technical writings, both of governmental and of private origin, the suggestion of Whitney has been followed with varying fidelity during the last thirty-five years. It is clear that the inherent connotation of "Cordilleras" is different from that of "Cordillera." The one emphasizes the compound nature of the orographic unit; the other, the singular form of the word, emphasizes the organic union of members. Hayden used both forms of the word. In recent years there has been a rather widespread adoption of the term in the singular number. In 1874, J. D. Dana proposed that the great mountain systems of North America be referred to as the "Western Cordillera" and the "Eastern Cordillera," the latter thus synonymous with what is now commonly called the Appalachian system. Russell, in 1899, proposed

"Pacific Cordillera" and "Atlantic Cordillera" with respectively the same significance. Usage has, however, declared that there is but one Cordillera in North America. The expression "Pacific Cordillera" is, according to such established usage, redundant. "The Cordillera of North America," "The Cordilleran System," "The Cordilleran Region," or, with the proper context, simply "The Cordillera," seem to be to-day the best variants on the Humboldt root-word.

The fine, dignified quality of the word, convenient in adjective form as in noun form, its unequivocal meaning and its really widespread use in atlas and monograph make "Cordillera" incomparably the best term for technical and even for the more serious popular works. In fact, there seems to be no good reason why the name should not be entered in elementary school atlases. The objection that the word is likely to be mispronounced by teacher or scholar would equally exclude "Himalaya" and "Appalachian" from school-books. In teaching or learning what is meant by "the Cordillera," the teacher or scholar would incidentally learn so much Spanish. If, in the future, this should be deemed an intolerable nuisance, speakers in English could, in their licensed way, throw the accent back to the second syllable and avoid the unscholarly danger. The second objection that a cordillera is hereby made to include the extensive plateaus of Utah and Arizona or the great intermontane basins of the United States is more serious. It will, however, hardly displace the word from its present technical use as designating a single Earth-feature ruggedly mountainous as a whole, but bearing subordinate local details of form and structure not truly mountainous. If this objection be regarded as invalid by advanced scientific workers, it will have still less weight for popular or educational use.

The ordinary connotation of the term "highland" makes it unsuitable as part of the name indicating the world's vastest mountain group. Like Powell's name "Stony Mountains," suggested for the majestic Front ranges north of the Union Pacific Railroad, "highland" is "belittling." To most readers it would inevitably suggest Scotland's relief. If the word be raised to the dignity proposed in "Western Highland" or "Rocky Mountain Highland," the writer on the natural features of the Cordillera runs the risk of ambiguity in employing the indispensable common noun "highland," while dealing with local problems of geology, geography, or natural history.

For popular use, the best title alternative with "Cordillera" is, in the writer's opinion, "The Pacific Mountain System." It is suggested by Russell's "The Pacific Mountains." The addition of the word "system" seems advisable as stating the unity of the whole group. The proposal of J. D. Dana to restrict the common noun "system" to mean merely the group of ranges formed in a single geosyncline has to face overwhelming objections. The usage of generations is against it;

the enormous difficulty of actually applying it in nature is, perhaps, yet more surely fatal to the idea.

The restriction of the titles "Pacific Ranges" (Hayden), "Pacific Mountains" (Powell in his earlier use of that term; he has since applied it to the whole Cordillera), and "Pacific Mountain System" (A. C. Spencer and A. H. Brooks) to the relatively narrow mountain belt lying between the ocean and the so-called "Interior Plateau" of the Cordillera, seems particularly unfortunate. If there is one grand generalization possible about the entire Cordillera, it is that the Cordillera is, both genetically and geographically, a Pacific feature of the globe. The Rocky Mountain ranges proper, the Selkirks, and the Bitter Roots bear the marks of interaction of Pacific basin and continental plateau as plainly as do the Sierra Nevada, the Coast ranges, or the St. Elias range. The large view of the Cordillera assuredly claims the word "Pacific" for its own, and cannot allow in logic that "Pacific Mountain System" shall mean anything less than the entire group of mountains. The artificial nature of the narrower definition would be equally manifest if it were applied to a topographic or genetic unit forming a relatively small part of the Andes along the immediate shore-line of South America. The Andes mountains form the Pacific mountain system of South America as the whole North American Cordillera forms the true Pacific mountain system of North America.

Yet the term "system" is itself so elastic that it is fitly applied to subdivisions of the Cordillera. For example, the "Rocky Mountain System" expresses an unusually convenient grouping of the northern ranges in Alaska, and of the eastern ranges of the Cordillera in Canada and the United States. Popular, as well as scientific, usage has once for all recognized the propriety of there being in name, as well as in fact, system within system in the grouping of mountains.

The Diverse Naming of Ranges crossed by the 49th Parallel (the International Boundary).—There is a double difficulty in describing the mountains along the international boundary. The same range may bear different names with different authorities, or may be differently delimited by different authorities. Some examples chosen from recent atlases and texts will illustrate this point.

1. *Cascade range* (also called Cascade chain or Cascade mountain chain), according to different authorities—

(*a*) Extends from Mount Shasta into the Yukon territory;

(*b*) Extends from Mount Shasta to the British Columbia boundary;

(*c*) Extends from Mount Shasta to the Fraser river, and east of it to the Thompson river;

(*d*) Forms the extreme northern part of the British Columbia Coast range north of Lynn canal, the real Cascades being mapped as the "Coast Range" (Johnson's 'Cyclopædia').

2. *Coast range* of British Columbia, also called the "Alpes de Colombie" (Atlas Vidal-Lablache) and "See Alpen" (Stieler's Handatlas, which continues the "Cascaden Kette" across the Fraser river). See also usages under "Cascade Range."

3. *Selkirk mountains*, according to different authorities—

(*a*) Lie west of Kootenay lake, entirely in Canada, or extending into the United States;

(*b*) Lie west of Kootenay lake, and either entirely in Canada or extending into the United States;

(*c*) Extend on both sides of Kootenay lake, but entirely in Canada.

(*d*) Do not extend south of the northern extremity of Kootenay lake;

(*e*) Contrary to all of the above-mentioned usages, extend across the Columbia river north-westward to Quesnel lake in 53° N. lat. (Brownlee's Map, 1893).

4. *Purcell range*, according to different authorities—

(*a*) A local rangelet in the West Kootenay district, British Columbia;

(*b*) Includes all the mountains between Kootenay lake and the Rocky Mountains proper, entirely in Canada;

(*c*) Includes the same mountains as under (*b*), but extends into the United States as far as the great loop of the Kootenay river.

5. *Bitter Root mountains* (also spelled "Bitterroot") used—

(*a*) In the larger sense of most maps; or

(*b*) In a much narrower sense, a small range overlooking the Bitter Root river (Lindgren).

6. *Rocky Mountains or Rocky Mountain system*, also called the Front range, and Laramide range; often alternative for "Cordillera."

7. *Gold range* of British Columbia, a name applied to a local range crossed by the main line of the Canadian Pacific Railway, and west of the Columbia river; also applied to a much greater group, including the Selkirk, Purcell, Columbia, Cariboo, and Omineca ranges (Gold ranges, an alternative form of the title in this latter meaning).

The confusion of the nomenclature is aggravated in the case of certain atlases, which in different map-sheets give different titles to the same range. Thus, on one map of the new Rand-McNally 'Indexed Atlas of the World,' the western mainland member of the Cordillera in British Columbia is correctly named the Coast range, on another sheet incorrectly named the Cascade range. The same indefensible carelessness even appears in certain Canadian school atlases. In the Rand-McNally map of British Columbia, the Selkirks are represented as ending on the south at the head of Kootenay lake, and are continued to the eastward of that lake by the "Dog Tooth Mountains," the latter

name absolutely unfamiliar to the people of British Columbia. In the general map of the United States published in the same atlas, the Selkirks are represented as quite defined to the westward of Kootenay lake. The area thus inconsistently mapped has a width equal to the average width of the Alps.

The Adopted Nomenclature of the Boundary Mountains.—On the line of the 49th parallel of latitude, the Cordillera has already assumed what may be called its British Columbia habit as contrasted with its 40th parallel habit. The division of the whole into orographic units is relatively simple in Colorado, Utah, Nevada, and California, where the building and erosion of the Cordillera have resulted in a comparatively clear-cut separation of the component ranges by broad intermontane plains of mountain waste or of lava filling vast structural troughs or basins. Nothing quite comparable is to be seen anywhere in the Canadian portion of the Cordillera. Near the latitude of Spokane, the whole mighty group of ranges is marshalled into a solid phalanx of closely set mountains which sweep on in substantial unity north-westward through Yukon territory into Alaska. The area of British Columbia alone would enclose twenty-four Switzerlands. For purposes of exposition this mountain sea must be divided and subdivided. How shall it be done?

The remarkable insight and generalizing power of the pioneer in British Columbia geology, G. M. Dawson, early supplied what seems to be the only fruitful principles. His classification applies chiefly to Southern British Columbia, but it is probable that its principles must be extended throughout the Canadian Cordillera. In 1879 Dawson announced the possibility of a natural division of the mountains between the 49th and 55th parallels into three broad belts paralleling the coast.

The middle belt, the "Interior Plateau," afterwards described in some detail, has the special style of topography characteristic of closely folded mountains once reduced by denudation to mere rolling hills or an imperfect plain since uplifted and cut to pieces by streams. In other words, the Interior Plateau is, by Dawson's definition, an uplifted, dissected peneplain, a region of plateaus and hills remnant from the old surface of denudation. Yet Dawson himself concluded that, while many of these tabular reliefs may be correlated into the ancient facet of denudation, other similar reliefs in the belt are structural, and due, namely, to the erosion of wide flat-lying lava-flows that flooded the country after the peneplanation. Another and simpler explanation of the topography makes the lava flooding anterior to peneplanation. Still, a third history may, on further investigation, turn out to be the true one. At the present time it is impossible to decide between the rival views.

A safer definition of the region is purely topographic; it may thus

be called the Belt of Interior Plateaus, or, briefly, the Interior Plateaus. This slight change in Dawson's name lays stress upon the individual tabular reliefs so characteristic of the region. These reliefs are *facts*; the peneplain and the involved assumption that the myriad individual reliefs belong to a physiographic unit, a single uplifted peneplain, are matters of theory. The pluralizing of the word "plateau" in the title not only changes the emphasis, but, in so doing, restores the term to its more advisable definition of a tabular relief bounded by strong downward slopes. The Interior Plateau as defined by Dawson is bounded on all sides by the strong upward slopes of the enveloping mountain ranges.

The belt of the Interior Plateaus having thus been differentiated on special grounds, we may pass to the subdivision of the remaining two parts of the British Columbia complex. Those two belts separated by the plateau belt are rugged, often alpine, and, as a rule, do not show tabular reliefs. Present knowledge of the vast field cannot provide a rational treatment of these mountains rigidly on the basis of either rock-composition or structural axes or geological history. It is possible, if not indeed probable, that the ranges immediately bounding the belt of Interior Plateaus have had a common history with it; they certainly include the same rock-formations as occur in the interior plateaus. If the peneplain theory be finally accepted for the latter, it may ultimately prove best to treat the Coast range and other ranges in terms of the same theory. The only feasible scheme of subdivision at the present day must be based on topography only.

Mere hypsometry will not serve alone; the ranges of summit altitudes is too slight, their variation too unsystematic, for that. Dawson found that continuity of crest-lines and the position of the greater erosion valleys formed the most available basis of classification. As field work progresses in British Columbia, it becomes more and more certain that this double principle is the best that could be devised for present use. Many of the larger valleys are undoubtedly located on structural breaks, but it is yet more evident that the strength of most of the valleys is the more direct result of fluviatile and glacial erosion. Owing to the peculiarly complicated rearrangements in the drainage of the Cordillera, whether due to glacial, volcanic, or crustal disturbances, or to spontaneous river adjustments, the valleys of British Columbia are in size very often quite out of relation to their respective streams. For example, the longest depression in the whole Cordillera is occupies. by relatively small streams, the headwaters of the Kootenay, Columbia, Fraser, etc. Each of the rivers named, in its powerful lower course, flows through narrow canyons. Erosion-troughs rather than rivers have, therefore, been selected by Dawson and other explorers as the natural lines of demarcation between most of the constituent ranges of the Cordillera in these latitudes. The procedure is not new, but it is

noteworthy as the most wholesale application of the principle on record. It stands in contrast to the more structural treatment, not only possible, but enforced by the orographic conditions in the United States.

In the course of his own work, the writer has become convinced of the permanent value of Dawson's early and consistently held general view of the British Columbia mountains. But there has arisen the necessity of extending it to cover the boundary mountains which, for the most part unvisited, were left unnamed by Dawson. The task of systematizing them is simple only in the stretch from the Great Plains to the Kootenay river at Tobacco Plains, a width of about 75 miles. The remainder, or five-sixths, of the Cordillera on the international line is either not grouped into organic units at all, or, where so grouped, the names of the groups are not universally accepted. In attempting to supply this lack of system, the writer's aim has been to avoid, as far as possible, the introduction of new names. In fact, it seems best to develop a system of grouping and nomenclature largely founded on names and concepts already in use, but not generally applied to the mountains so far south as the boundary.

A point of departure is readily found. Within the Cordillera on the 49th parallel, there are eleven principal longitudinal valleys which serve as convenient lateral boundaries for the members of the system. Of these, four belong to the first rank. The wide valley occupied at the boundary by the Kootenay river is the easternmost and much the longest. It is a part of a single Cordilleran feature easily the most useful in delimiting the Canadian ranges. From Flathead lake to the Liard river, a distance of about 800 miles, this feature has the form of a narrow, wonderfully straight depression lying between the Rocky Mountain system and all the rest of the Cordillera. Unique among all the mountains of the globe for its remarkable persistence, this depression is in turn occupied by the headwaters of the Flathead, Kootenay, Columbia, Canoe, Fraser, Parsnip, Finlay, and Kachika rivers, and is therefore not fairly to be called a valley. It may for present purposes be referred to as the "Rocky Mountain Trench." The term "trench" throughout this paper means a long, narrow, intermontane depression occupied by two or more streams (whether expanded into lakes or not) alternately draining the depression in opposite directions.

The first-rank valley next in order on the west is also occupied at the boundary by the Kootenay river, returning into Canada from its great bend at Jennings, Montana. This valley begins on the south near Bonner's Ferry, Idaho, and is continued north of Kootenay lake by the valley of the Duncan river. Recently A. O. Wheeler has shown that the singular 50-mile trough occupied by Beaver river, which enters the Columbia river at the Canadian Pacific railway, is precisely *en axe* with the Duncan river valley. The whole string of valleys from Bonner's

Ferry to the mouth of the Beaver, a distance of approximately 200 miles, forms a topographic unit that may be called the "Purcell Trench."

The third of the first-rank valleys is drained southward by the Columbia river, expanded upstream to form the long Arrow lakes. At its northern extremity near the 52nd parallel of latitude, this valley is confluent with the Rocky Mountain trench. The southern termination of the valley regarded as a primary limit for these mountain ranges occurs about 60 miles south of the 49th parallel, where the Columbia enters the vast lava plain of Washington. To distinguish this orographic part of the whole Columbia valley between the points just defined, it may be called the "Selkirk Valley."

A glance at the map will show that the two primary trenches and the Selkirk valley are in simple mnemonic relation to three principal mountain divisions of the Cordillera. They lie respectively to the westward of the Rocky Mountain system, the Purcell range, and the Selkirk system.

The fourth of the first-rank valleys carries the south-flowing Okanagan river, with its various upstream expansions, including Osoyoos and Okanagan lakes. The latter lies wholly within the belt of Interior Plateaus, a primary Cordilleran division. Important as Okanagan lake is, no one has yet suggested that the plateau belt itself be subdivided into named portions separated by the lake. It appears, on the other hand, wiser to recognize in the nomenclature the essential unity of the belt. The southern portion of the Okanagan valley stretching from the mouth of the Similkameen river to the confluence with the Columbia, has, however, a decided function in separating the Cascade range from the very different mountains east of the Okanagan river. This portion may be called the lower Okanagan valley.

The seven second-rank longitudinal valleys have unequal authority in delimiting constituent ranges. The valley of Waterton river and lake, with the parallel valleys of the Flathead and Wigwam rivers, are well known to divide the Rocky Mountain system at the boundary respectively into the Lewis, Livingstone, MacDonald, and Galton ranges. Similarly, the valleys of the Skagit and Pasayten rivers subdivide the Cascades into the Skagit range, the Hozomeen range, and the Okanagan range. The Kettle river valley of British Columbia, in part, and the Pend D'Oreille valley of Washington, in part, are likewise subordinate longitudinal depressions which merit attention, although they have never hitherto been used in delimiting ranges.

Transverse valleys may also be employed if this method of orographic treatment is applied to the fullest practical extent. These will be referred to in connection with certain of the ranges now to be described as primarily bounded by the longitudinal valleys and trenches. Finally, the Great Plains, the lava plain of Washington and Idaho, the straits of

Georgia and Juan de Fuca, form other and obvious boundaries to some of the subdivisions.

As already suggested, the Rocky Mountain system has an extraordinarily definite limit on the west—the Rocky Mountain trench. The eastern escarpment, broken as it is in detail, is also notably straight and continuous along the 1000-mile front from Montana to Yukon territory.

Westward from Tobacco Plains, on the 49th parallel, we cross, in the air-line, 60 miles of ridges belonging to a range unit which is almost as systematic as the great group on the east. The crests of this second group are in unbroken continuity from the wide southern loop of the Kootenay river at Jennings to the angle where the Purcell trench is confluent with the Rocky Mountain trench. Throughout this area the drainage is quite evenly divided by the easterly and westerly facing slopes of the unit-relief. This strong and extensive range has, in its northern part, been generally regarded as part of the Selkirk mountain group. The middle and southern part, though broader and including most of the area, has, as a whole, never been authoritatively placed in the Selkirk system. Palliser gave the name "Purcell Range" to a single component of the unit, namely, the group of summits lying between Findlay creek and St. Mary river. Dawson extended the name to cover all the mountains between Kootenay lake and the Rocky Mountain trench, these mountains forming the "Purcell division of the Selkirk system;" but he did not fix either a northern or a southern limit to the group so named.

The same usage appears in the maps and texts of most geographers publishing during the last twenty-five years. It was officially adopted by the Canadian Geological Survey, and appears in the general geological map of the Dominion edited by Selwyn and Dawson, and issued by the survey in 1884. The name was accordingly entered in most of the American and European atlases of the world. For some unknown reason, the second edition of the official geological map of the Dominion (1901) represents the Purcells as constituting merely Palliser's original small group of summits, and this tradition has been followed in the new general map of the Dominion issued by the Canadian Department of the Interior (1902). Both official and general previous usages conflict with this quite recent official return to Palliser's mapping. In reality, the Palliser usage is not familiar to the people of British Columbia; it is subject to the criticism that the rangelet mapped by Palliser is not defined on the west by natural limits. The lack of definition in Palliser's exploratory sketch-mapping is such that it may even be doubted that Dawson really broke the law of priority in giving "Purcell Range" its broader meaning. The name is practically useless if it be not so extended. The long-established tradition of the influential atlases following the lead of Dawson makes it expedient to use the title in the broader meaning.

The question remains as to the northern and southern limits of the Purcell range. As a result of compiling all the available information, the writer has concluded that the range has no natural boundary to the northward, short of the confluence of the Purcell and Rocky Mountain trenches. The conclusion has been strikingly corroborated by the detailed studies of Wheeler along Beaver river. There is, similarly, no natural boundary on the south, short of the great bend of the Kootenay river in Montana. However vaguely supported by definite knowledge of the field, the latter conclusion has been anticipated by the editors of the 'Century Dictionary Atlas' (map of Montana), of the 'Encyclopædia Americana' (maps of British Columbia, Montana, and Canada), of Bartholomew's 'English Imperial Atlas,' of Keith Johnston's 'Royal Atlas,' and of Stieler's 'Handatlas.' Maps occurring in all of these works represent the Purcell range as continuing southward into the United States as far as the Kootenay river. So far as known to the writer, there is no popular or official designation for the mountains lying between that river and the Canadian boundary. The Cabinet mountains lie entirely south of the Kootenay river.

In summary, then, the great range unit here called the Purcell range is bounded by the Rocky Mountain trench, the Purcell trench, and the portion of the Kootenay valley stretching from Jennings, Montana, to Bonner's Ferry, Idaho.

The Selkirk mountain system next on the west likewise forms a range unit considerably longer than the area generally ascribed to the Selkirk group. On grounds similar to those adopted for the Purcell range, the Selkirk system may be defined as bounded on the east by the Purcell trench; on the north and north-east by a portion of the Rocky Mountain trench; on the west by the Selkirk valley; on the south by the Columbia lava plain, Pend D'Oreille lake, and a short unnamed trench extending from that lake to the Purcell trench at Bonner's Ferry. For a short stretch the Selkirk system is apparently confluent with the Cœur D'Alene mountains, though a short trench followed by the Great Northern railway may separate them. This extension of the Selkirks across the boundary has already been indicated on maps of the 'Encyclopædia Americana,' Stieler's 'Handatlas,' and the Vidal-Lablache atlas. That part of the Selkirk system lying south-west of the deep valley of the Pend D'Oreille river may be called the group of the Pend D'Oreille mountains. The well-known Slocan mountains are also separated off definitely by the Slocan trench, which is a longitudinal depression occupied by Slocan river, Slocan lake, and the creek valley mouthing at Nakusp, on Arrow lake.

The whole mountain complex embracing the Purcell range and Selkirk system, as just defined, may be viewed in another way. The Purcell range is thereby considered as part of the Selkirk system, and that division of the whole lying to the westward of the Purcell trench,

might be called the Selkirk range. The Selkirk system would thus include the Selkirk range and the Purcell range. As already noted, Dawson seems to have adopted this alternative view. An objection to it is the chance for confusion in using "Selkirk" to mean now a component range, now the inclusive system. In favour of Dawson's view is the fact that in rock composition, structural axes, and geological history, the mountains lying between the Rocky Mountain trench and the Selkirk valley form part of a natural unit. On the other hand, the Selkirk range is, structurally and lithologically, as closely allied to the Columbia system as to the Purcell range; the Purcell range is, lithologically and historically, as closely allied to the Rocky Mountain system as to the Selkirk range. The practicable orographic classification, being based upon erosion troughs, recognizes the dominant importance of the Purcell trench. That superb feature of the Cordillera cleaves the mountains in so thoroughgoing a manner that a logical grouping must regard the Purcell range as a member co-ordinate with the Selkirk range.

In the map the latter division is called the Selkirk system, because in the diagram it expressly includes the Slocan and Pend D'Oreille mountains. If, for purposes of exposition, this comprehensive character is not fixed for emphasis, the same Cordilleran member may be called the "Selkirk Range." Similarly, when the Purcell range is, in the future, subdivided into its orographic units, it may bear the name "Purcell System." "Cascade Range" and "Cascade System," "Coast Range" and "Coast System," for example, may be profitably employed with the same distinctions. In all these cases it is a matter of emphasis.

The value of this distinction in common nouns, the great orographic significance of the Purcell trench, and the weight of much authority in previous usages have caused the writer to suggest that the whole Purcell range be considered as co-ordinate with, and not part of, the Selkirk system.

The principal range unit adjoining the Selkirk system on the west is here called the Columbia system. It is definitely limited on the east by the Selkirk valley and by a part of the Rocky Mountain trench, the latter truncating the northern end of the Columbia system as it does the Selkirk and Purcell groups. On the south the Columbia system is limited by the Columbia lava plain. On the west the limit is determined by the lower Okanagan valley, and, to the northward, less well by the eastern edge of the belt of Interior Plateaus. That edge may be located for about 30 miles in the line of the main Kettle river valley. North of the main line of the Canadian Pacific railway, the belt of Interior Plateaus seems to reach, but not cross, Adams lake and Adams river. Still farther north, the western limit of the Columbia system is fixed by a trench occupied by the headwaters of the North Thompson river, and by an affluent of the Canoe river. North-west of this trench begins the great system including the Cariboo mountains.

Apparently the first official (Governmental) name for the mountains explored on the Canadian Pacific railway line west of the Columbia river was "Gold Range."* The group so named extends from the latitude of Shuswap lake to the narrows between the Arrow lakes. This usage has been adhered to by the Government of British Columbia.† In 1874, the Dominion Department of Railways and Canals introduced the name "Columbia Range" for the much larger mountain group including the "Gold Range," and extending from the headwaters of the north Thompson river southward to lower Arrow lake.‡ This usage was confirmed by Selwyn and Dawson, each in turn director of the Geological Survey of Canada.§ Nevertheless, the new general map of Canada issued by the Department of the Interior at Ottawa (1902) gives the name "Gold Range" to this larger group. The extension of the limits of the Gold range is a departure from the official tradition of both the provincial and Dominion governments. It appears best to hold the name "Gold Range" to its original designation of a local mountain group, and retain the title "Columbia Range" with a broader meaning.

For the immense Cordilleran unit stretching from end to end of the Selkirk valley, and bounded on the east by the Columbia river, there is no question that the name "Columbia Range" is more significant and appropriate than the name "Gold Range." The latter name has a special disadvantage worthy of note. Although Dawson, in his later writings, used the name "Gold Range" in its original sense of a local mountain group, he as often uses "Gold Range" or "Gold Ranges" to include the Selkirk, Purcell, "Columbia" (!), Cariboo, and Omineca ranges. This inconsistent usage robs the title "Gold Range" of even that modicum of value which it has as an alternative for the more significant title. As already stated, the name "Columbia Range," with its comprehensive meaning, has, moreover, the priority.

The extension of the apposite title, "Columbia Range" (with variant "Columbia System"), to cover the larger area described in the foregoing paragraphs is, it is true, not according to tradition, but, as in the case of the Selkirk system and Purcell range, the widening of the meaning is justified by the lack of definition as to the true areal extent of the "Columbia Range" in its original use, and is enforced by the fact of crest continuity within a fairly well delimited belt of the Cordillera.

* Map of British Columbia, compiled under the direction of the Hon J W. Trutch, Chief Commissioner of Lands and Works and Surveyor-General Victoria, 1871

† Map of the province of British Columbia, compiled by J. H. Brownlee by direction of the Chief Commissioner of Lands and Works Victoria, 1893.

‡ S Fleming, Exploratory Survey, Canadian Pacific Railway report, Ottawa, 1874 Map-sheet No. 8.

§ Forest Map of British Columbia, published by G M Dawson in Report of Progress, Geol. Surv of Canada, 1879 80

The southern third of the Columbia system is characterized by comparatively low mountains, which, in rock-composition, are allied both to the northern part of the range and to the belt of Interior Plateaus. These southern mountains commonly show uniformity in summit levels. Yet there are not remnant plateaus, and it is advisable to recognize in these mountains a group distinct from the Interior Plateaus. A convenient name for the unit, "Colville Mountains," was given as early as 1859-60 by the members of the Palliser Expedition. The northern limit of this division of the Columbia system cannot, for lack of cartographic data, be fixed, but it doubtless occurs near the headwaters of the Kettle river. The north fork and main trunk of that river form the eastern boundary of the Colville group. Otherwise, the group comprises the whole of the Columbia system south of the international boundary.

A second important, though small, natural subdivision of the system is limited on the north, east, and south by the Selkirk valley; on the west, by the lower Kettle valley, and by a short trench running from lower Arrow lake to Christina lake and the Kettle river at Cascade. This group may be called the Rossland mountains.

The more northerly part of the Columbia system is yet too imperfectly known to permit of similar subdivision.

As we have seen, the belt of Interior Plateaus is of primary importance in the systematic orography of the Cordillera. It is difficult of delimitation. On nearly all of its boundaries the belt fades gradually into the loftier, more rugged ranges encircling it. Its limits have been compiled and drawn on the map (p. 588), after a study of Dawson's numerous reports of exploration. The limits are to be regarded as only approximate. The plateau character is obscure at the 49th parallel, but the roughly tabular form and considerable area of "Anarchist Mountain" immediately east of Osoyoos lake, seems to warrant the slight extension of the belt across the international line. The southernmost limit of the belt is an irregular line following—(1) the main Kettle river valley; (2) a quite subordinate trench occupied by Myer's creek and Antoine creek, in the state of Washington; (3) a part of the lower Okanagan valley; and (4) the Similkameen-Tulameen valley.

Usage, both official and popular, has gone far toward finally establishing the nomenclature for the immense ranges lying west of the Columbia lava plain, Colville mountains, and belt of Interior Plateaus. The Cascade range is now defined on the principle of continuity of crests, not on the basis of rock-composition. At the cascading rapids of the Columbia river the range is a warped lava plateau; in northern Washington it is an alpine complex of schists, sediments, granites, etc. In British Columbia, Dawson adopted the name "Coast Range" to enforce the view that the granite-schist British Columbia mountains on the seaboard should be distinguished from the lava-built Cascades, as

originally named, at the Columbia river. It has, however, become more and more evident, as the study of the Cordillera progresses, that rock-composition can never rival crest continuity as a primary principle in grouping the western mountains. Meanwhile, the name "Coast Range" has survived, and is, in fact, the only name officially approved by the Geographic Board of Canada for any principal division of the Cordillera.

Dawson did not fix a southern limit for the Coast range. General usage has not fixed the northern limit of the Cascade range. The solution of the problem is obvious if the principle of limiting units by master valleys and trenches be applied. The Fraser river valley clearly supplies the required boundary between the two ranges. There seems to be no other simple adjustment of the two usages, which undoubtedly sprang up because of the existence of a political boundary at the 49th parallel. It is important to note that the delimitation here advocated is not new, since it appears on two of the earliest official maps of British Columbia—those accompanying the 1859 British Blue Books, entitled 'Papers relative to the affairs of British Columbia.'

The remaining boundaries of the Cascade and Coast ranges, as well as the boundaries of the Olympics and of the Vancouver range, are at once derived from the map, and need no verbal description. These natural boundaries seem in large part to be located along structural depressions, and belong, therefore, to a type unusual in the Canadian Cordillera.

Summary.—The writer keenly feels the responsibility of suggesting many of the changes and additions proposed in the cartography of this large section of the Cordillera. The attempt to describe the geology of the boundary belt without some kind of systematic orography on which to hang the many facts of spatial relation, is veritably the making of bricks without straw. The scheme outlined above has thus developed out of a clear necessity.

The orography of the international boundary cannot profitably be treated without reference to longitudinal Cordilleran elements, often running many hundreds of miles to northward and southward of the boundary. For this reason the accompanying map is made to cover all of the Cordillera lying between the 47th and 53rd parallels of latitude.

The terms "range" and "system" are used in their common elastic meanings, with "system" more comprehensive than "range." The Cordilleran system, or Cordillera, includes the Rocky Mountain system, the Selkirk system, etc. The Cascade range includes the Okanagan range, Skagit range, etc. A system may include among its subdivisions a mountain group without a decidedly elongated ground-plan; thus the Columbia system includes the Colville mountains. But both "range" and "system," used with their respective broader or narrower

meanings, involve the elongation of ground-plan and a corresponding alignment of mountain crests. The great weight of popular and official usage seems to render it inadvisable to attempt any more systematic organization of the common nouns in this case. It has been found almost, if not quite, as difficult to organize the proper names in an ideal manner.

The basis of mountain grouping is purely topographical, and is, in the main, founded on established usage. A primary grouping recognizes within the Cordilleran body two relatively low areas, characterized by tabular reliefs, accompanied by rounded reliefs, generally accordant in altitude with the plateaus. These two areas are the belt of the Interior Plateaus in British Columbia and the Columbia lava plain of the United States. The remainder of the Cordillera—ridged, peaked, often alpine—is divided into systems, ranges, and more equiaxial groups, either by "trenches," by master valleys, or, exceptionally, by structural depressions.

The Cascade range, the Olympic mountains, the Vancouver range, and the Coast range of British Columbia, with their continuations north and south, compose what may be called the Coastal system. All the ranges east of the Rocky Mountain trench, with their orographic continuations north and south, constitute the Rocky Mountain system. The Columbia lava plain and the belt of Interior Plateaus form the third and fourth subdivisions. A fifth more or less natural grouping, yet lacking a name, includes the Bitter Root, Clearwater, Cœur D'Alene, Cabinet, Flathead, Mission, and Purcell ranges, the composite Selkirk system, and the composite Columbia system, with the unnamed system including the Cariboo mountains.

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DR. SVEN HEDIN'S JOURNEY IN CENTRAL ASIA: SCIENTIFIC RESULTS.*

THIS work, in every respect on a large scale, is thus announced. -It will "embrace the following divisions: Maps contained in an atlas of two volumes and consisting of about 120 plates.

"Text.—Vol. 1. The Tarim River, by Dr. Sven Hedin.
Vol. 2. Lop-nor, by Dr. Sven Hedin.
Vol. 3. North and East Tibet, by Dr. Sven Hedin.
Vol. 4. Central and West Tibet, by Dr. Sven Hedin.
Vol. 5, Part I. Meteorology, by Dr. Nils Ekholm.
„ Part II. Astronomical Observations, by Dr. K. G. Olson.
Vol. 6, Part I. Zoology, by Prof. Dr. Wilh. Leche.
„ Part II. Botany, by Prof. Dr. G. Lagerheim and others.
„ Part III. Geology, by Dr. H. Backström.
„ Part IV. Archæology, by Mr Karl Himly."

* 'The Scientific Results of a Journey in Central Asia, 1899–1902.' By Dr. Sven Hedin. Stockholm: Lithographic Institute of the General Staff of the Swedish Army; London: Dulau & Co.; Leipzig: F. A. Brockhaus.

Of these, vols. 1, 2, 5 Part 1., 6 Part I., and two volumes of maps, containing 22 and 37 sheets respectively, have been received for present consideration..

As there is neither preface nor introduction to vol. 1, the *Geographical Journal*, vol. 24, pp. 524–545, containing the Doctor's description of his objects and aspirations, may be consulted. Condensing this, it is enough to say that the work is published with the assistance of the Swedish Government, that the first four volumes will contain 2000 pages, and that the atlas would probably extend to 120 sheets. The remaining volumes are prepared from Dr. Hedin's notes, observations, and specimens, by various experts. The atlas is described as the *pièce de résistance* of the entire work, the result of a mode of survey with a chronometer and a compass which "yielded amazingly accurate results." A general map on the scale of 1 : 2,000,000 was contemplated, but it was considered more expedient to have sixteen sheets on the scale of 1 : 1,000,000. In addition there are facsimile reproductions, which it is hoped may be of use to younger explorers.

The text, originally written in Swedish, had to be published in one of the great world languages; English was chosen, a compliment which we beg to acknowledge, and Mr. J. T. Bealby, B.A., translated. An explanation of the transliteration of oriental words is offered, and it is stated that "the metric system, as well as the thermometric scale of my countryman Anders Celsius" is used; "and it is not my fault if the conservatism of the English-speaking world makes these two systems less familiar than they ought to be to the readers of the book."

The text is arranged and observations are recorded so as to form a commentary "day by day and sheet by sheet to the maps in the atlas." The author imagines that readers of vol. 1 will be surprised at not finding a single quotation in its 512 pages. "It is nowadays esteemed a merit to overload a scientific work with quotations of every sort and degree; they are proof of wide reading and learning." We can assure him that any such surprise is promptly converted to gratitude on turning to vol. 2, in which the numerous and lengthy quotations, chiefly German, are a source of irritation and somewhat out of proportion in an English translation, which certainly does not require the additional weight involved.

Vol. 1 consists of four chief sections—the Tarim, the lakes on the lower Tarim, the Charchan desert, and the Tarim delta.

Vol. 2 comprises the Kara Koshan, the Kuruk tagh, a part of the desert of Gobi, the desert of Lob, and above all, the former Lob-nor.

Explanation of the arrangement of subjects follows, and the close connection between vols. 1 and 2 is pointed out; attention is invited to the illustrations—for the most part, reproductions of photographs and sketches of uncommon merit by the author, who quite unnecessarily appears to apologize for the scantiness of the records of his work.

Such, in short, are the chief subjects dealt with in vols. 1, 2, and the maps, to which at present consideration is confined.

And now a few further introductory words. The eminence of Dr. Sven Hedin as an explorer, as a contributor to the details of geography, and as an accomplished linguist, has been already abundantly and deservedly acknowledged; sometimes, perhaps, in terms stronger than may be palatable to his modesty. So of these accomplishments we shall say no more. Attention, however, is invited to his remarkable artistic powers, evidenced chiefly by pen-and-ink sketches, landscape and figure, but manifest also in his topographical drawing. Specimens justifying this praise, in which the desired effect is produced with a minimum of lines, can readily be selected from the illustrations or plates.

Passing now to the country concerned, and the problems involved in its peculiar circumstances, the former may reasonably be likened to a basin or series of basins surrounded on three sides, north, west, and south, by hills, in plan roughly like a horseshoe, highest generally at the toe, and falling off towards the heel, which is more or less open to the east towards the deserts of Mongolia. The extent is great; from Kashgar in the west (76° E. long. appr.) to Shachau in the east (95° E. long. appr.), and between lats. 36° and 42° N. The surrounding ranges are, generally: on the north the Tian Shan, the celestial mountains, culminating at Khan Tengri, and gradually wearing away eastwards, under the names Chol tagh (desert range) and Kuruk tagh (dry range); on the south, the Kuen lun, the Altin, or Astin tagh; * on the west, the Pamirs and watershed between the rivers which flow west to Lake Aral and the Caspian, and those which run east and are lost in the desert of Lob.

The great basin or desert thus enclosed is subdivided, for the sake of convenience, into two main parts: the greater, lying south and west of the Yarkand river and other waters which at present fall into the Kara Koshan lake, is called generally Takla Makan; the lesser part, east of the rivers, contains the Lob desert north of the lake, and the desert of Kum tagh (sand mountains) east and south. The Takla Makan is again subdivided into the deserts of Charchan, Keria, etc., from the names of rivers or localities.

The chief interest and great marvel of this country is found in the long-continued and possibly never-ending fight, now in full progress, between the aggressive sand from the east and the defensive water mainly from the west. It is a strange battle curiously complicated. For elements of destruction there are the variations of temperature; the disintegration of the hills, specially towards the east, the lighter

* Known by the Russian Geographical Society as Prjevalsky's range (*Geo. Jour.*, vol. 9, p 547).

part or dust being carried to great heights and distance by the prevailing east-north-east wind; the heavier sand or gravel scoured along the land, which it furrows as it passes, driven by storms of incredible velocity, the accumulated sand being deposited, as the power of carrying it fails, in the forms of hills and waves of gigantic size. These in turn are in motion, pressing forward, forcing the rivers back, and with them the vegetation, cultivation, and population which they supported.

The defence seems, as usual, less vigorous than the attack. Rain or snowfall feeds the rivers, and though this undoubtedly varies from year to year, there is no reason to suppose that the average fall is materially less than it was, say, one or two thousand years ago. Yet during that time rivers have shortened, lakes have disappeared, trees and pasture have withered, villages and towns have been buried. When and where will equilibrium be established? The problem is difficult, possibly, in our present state of knowledge, insoluble; but as yet no scientific assistance has been given by men to what seems the weaker power, and this, wisely applied, might arrest destruction. It must also be kept in mind that the rivers, though warring against the sand, actually reinforce their enemy. For the glaciers grind the upper valleys of the catchment basin, and the silt thus generated, added to what is gathered by rain floods in intermediate parts, and scoured from the river-bed in its lower course, is deposited somewhere. If in the river-bed, that is raised till the water overflows or bursts its banks and forms great lakes or marshes, to the grievous loss of the defence through evaporation and absorption. The attenuated river passes on, repeating the process till it is exhausted, trickling by many channels through or over a delta raised by deposit above the surrounding country, and ultimately discharging into the most convenient hollow of the basin which becomes its terminal lake. But this lake itself is subject to similar change. Though naturally the greater part of the river silt is deposited before the lake is reached, yet some is carried in. Then sand and dust are blown in by the wind, and, as the depth decreases, reeds and plants appear on a scale difficult for dwellers in temperate zones to realize, accelerate the deposit and add materially to it, for they die and are reproduced annually.

If the silt is deposited outside the river-banks, it is either in lakes, which it tends to fill up, or it is formed on the surface of flooded land, which dries up as the river becomes smaller. The dry silt is readily scoured and moved forwards by the wind, augmenting the sand already in action. The river, too, is usually weakened by the abstraction of a considerable part of its volume; near the foot of the hills for irrigation, lower down for replenishing lakes whence fish are obtained. Hence, so far, man seems rather to weaken than to help the power which enables him to live.

Apart from this great problem, minor matters of interest have arisen, among them the controversy as to Lob-nor. The Chinese marked the lake on their maps where there is now no lake, and Prjovalsky during his travels came on the terminal lake of the water system, Kara Koshan, and not unnaturally called it Lob-nor. For Lob-nor was almost certainly the terminal lake of the Yarkand river and the Koncheh river from Lake Bagrash, their water being carried in a channel, Roborovski's Kum daria (sand river), better named by Hedin Kuruk daria (dry river). So, having found the terminal lake, he gave it the old name, believing that the position on the Chinese map was incorrect.

Apparently this is not so; there is evidence that the terminal lake was situated as shown on Chinese maps, and that Lao Lan, now in ruins exposed to the action of a sand-blast, was on its border. In time, doubtless under the process already described, the lake and river-bed silted up; the latter finding a new channel southwards, meeting the Charchan river in a lake called with doubtful accuracy Kara buran * (black storm), and thence passing to its final basin, the Kara Koshan lake. Curiously enough, this lake is now migrating towards Lob-nor whose bed is being fast scoured out by the wind; so that in course of time, and perhaps at no long period, the level of Lob-nor, which is being lowered, may fall beneath that of the Kara Koshan lake, which is being raised. In that case it is conceivable that Lob-nor may again become the terminal of the water system of the great amphitheatre. On the other hand, the tendency of the rivers to work westwards may defeat the chance of their resuming the channel of the Kuruk river, and their surplus water may find a more convenient outfall. The evidence of Dr Hedin seems to point to Lob-nor again becoming the terminal lake, though very likely supplied by new channels.

Of greater importance than the precise position at any moment of a changing and migrating lake, and of greater general interest, is the light likely to be thrown upon the former condition of a great part of the desert through which lay the highway between India and China, by the discoveries of buried ruins. The results of Dr. Hedin's work in this line have, no doubt, been carefully presented by the late Mr. Karl Himly. Dr. Stein, who (1900–1) was deputed by the Government of India to explore these remains systematically, whilst generally confirming Hedin, has greatly added to the value of his observations. Materials and implements of art or industry have been unearthed, and, more important still, many Kharoshthi documents, marvellously preserved, containing "records written as early as the third century of our era,

* Kara-boyön (black isthmus), M. V. Pyevtsoff's expedition (*Geo. Jour.*, vol. 9, p. 552).

and dealing with a wide range of matters of administration and private life" * in the sand-buried settlements, have been found.

These discoveries will help to enlighten us concerning the spread of Buddhism from India to Central Asia, China, and Japan; taken with the accounts of the reverse journeys or pilgrimages to sacred spots in India, they cannot fail to add materially to our present knowledge. One example is that by means of these writings it is possible to define the periods of the invasion of the sand into the buried ruins as extending from the third to the end of the eighth century A.D., and thus a measure of its victorious advance is obtained.

That and other evidence respecting the Takla Makan naturally lead to inquiry into the general question of the desiccation of the old world. Prince Kropotkin, in a highly interesting paper (*Geo. Jour.*, vol. 23, p. 722), stated his opinion that recent exploration confirmed the view that victory inclined to the battalions of sand: evaporation exceeded precipitation, and year by year the desert encroached on land which yielded pasture or was fit for cultivation. Desiccation, in short, was a natural reaction from the glacial period. It may be so, but, as Dr. H. R. Mill remarked, the water-vapour in the air is probably much the same in quantity during historic time; consequently, local desiccation is the result of unequal distribution. If the plateau regions are drying up, there is presumably compensation elsewhere.

The foregoing are the salient points of interest respecting this strange country as they occur to one who has considered the problems involved, both in the study and in the field. For similar features are present on a smaller scale in rivers and deserts of the Punjab; causes and effects are much the same, whilst their observation, record, and the power of making legitimate deduction, form part of the training of an irrigation engineer.

Passing to the consideration of the records vols. 1 and 2, their title, "Scientific Results," is somewhat misleading. They contain rather the profuse detail from which results might be condensed. In describing his journey on the Yarkand river from Lailik to Kuruk-Asti, the author thus sets forth his idea of what he had to do: "The task, therefore, which I have set myself in the following chapters, is to present a detailed description of the geography of the Tarim. I shall deal with the river-bed and its varying conformation in different parts of its course, as well as with the changing character of its erosive action upon the surface of the regions it flows through. The bends or sinuosities of the river, its silt beds, its alluvial deposits, its banks or erosion terraces, and their varying character according as the stream makes its way through forests, steppes and sand-deserts, or washes the foot of detached mountains; the highways, the riparian population and all that

* 'Sand-buried Ruins of Khotan,' Stein, p. xx.

concerns them, the irrigation canals, the navigation of the stream, and its fisheries—all these will be successively dealt with as far as my observations, and the information I gleaned about them, will admit. And I shall everywhere give the geographical names which are used in connection with the river itself, or in the immediate vicinity of its banks."

All this the author has done most conscientiously, perhaps in greater detail than the occasion warranted. For his surveys of six or seven years ago, and the maps so beautifully made from them at the Institute of the General Staff of the Swedish Army, are probably materially different from the present course of that most unstable river, and certainly in ten or fifteen years more may be nearly unrecognizable. The geographical names, too, are for the most part ephemeral, and in time may probably give way to new ones, for they chiefly define some transient incident on or near the river-banks.

Many measurements of the various rivers were made, the process being described on pp. 28–33, vol. 1. It was rough, no doubt—under the circumstances, nothing else could be expected; but so long as there is no insistence on the accuracy of any one observation, deductions from them being based on differences between the results of similar observations, students will not be misled. The use of the metric system and the adoption of a remarkable method of transliteration of oriental words render the English version of the book unnecessarily troublesome to read. As regards measurements, there may be reasons why foreign standards should be used in preference to English in an English translation, but they are not self-evident. No doubt centimetres, metres, and kilometres can by the aid of tables be converted into inches, feet, or miles; but the advantage of having to do so does not compensate for the waste of time involved. And what is to be said of versts and saschen, not to mention terms in the local vernacular? Of this, indeed, a far too liberal use is made when English equivalents are available; many sentences must be unintelligible to those not acquainted with oriental languages, whilst the transliteration of native words makes them a puzzle to those who are. The following extracts convey a notion of what is meant and of the trouble involved in reading the book: "After passing a fresh jarsik we came to the district of Tschimälelik, and beyond it to a couple of sharp bends with a boldschemal, and, on the left, a lateral bed called the Jakanlik-boldschemal, thirty-five years old; it contained stagnant water. . . . At Jäkänlik-tüschkun . . . there is a little *ortang*, no longer in use. Below it an arik (now dry) is led off to the *jajlaks* (or 'pasture grounds')." And so on, whilst English scholars of oriental languages are vastly exercised to recognize familiar words in the clothing which has been adopted. Thus Tschahr bagh (chär bägh?), mätschit (masjid), tschätschäk (chechak = small-pox); Tschaj (chäe = tea); Ciarcian, Tschertschen (Charchan); whilst Muhamede-

godsche-tutghutshtake-uji, "the house where M. collected feathers," is a puzzler. We do not for a moment venture to criticize the taste or accuracy of those who prefer oriental words in such disguise, but surely the lavish use of consonants must hamper competitors in the struggle for life.

Another difficulty which caused delay and unnecessary labour in reading vols. 1 and 2 is that there is great want of reference in the text to the particular sheet of the maps concerned, and also occasionally reference to maps or plates which could not easily be identified.

Having thus relieved our feelings, we may suitably record admiration for the endurance, physical and mental, which is attested first by the exploration involved, and next by the preparation of its record. The details of the dune formation are of great interest, and may with advantage be compared with the snow-waves and drifts described by Dr. Vaughan Cornish (*Geo. Jour.*, vol. 20, p. 137); some of the reproductions from photographs showing the wind-ripples on the dune surface are most beautiful specimens of the art, and very suggestive.

As regards vol. 5, Part I., it must suffice to mention that it contains elaborate tables with a brief explanation, and that vol. 6, Part I. treats of the zoology of the country. The plates in this volume are of remarkable excellence, both those in the text and the full-page collection of skeletons at the end. Throughout the work there are very few printer's errors, and they are of little consequence.

W. Broadfoot,
Major R.E. (retired)

RECENT EARTHQUAKES.

We may anticipate, with confidence, that the earthquake of April 18 will take a place in the annals of seismology only second to the Lisbon earthquake of 1755, or, if not in seismology, at any rate in popular histories of earthquakes, and for the same reason. Both were earthquakes of the first order of magnitude; the Lisbon earthquake was probably the second greatest of which we have any historic record, and that of San Francisco, though excelled by several, is still a very great earthquake, yet both would have passed with little notice but for the destruction to which they gave rise, and in both cases this destruction of life and property was only to a slight degree the direct result of the earthquake proper. In Lisbon the death-roll was due to the great sea wave, and in San Francisco to fire. The special correspondent of the *Times* has estimated that only 3 per cent. of the damage in San Francisco was directly due to the earthquake, the remaining 97 per cent. being due to fire, and in Lisbon the proportion was probably much the same; so great is the power of the familiar elements of fire and water as

compared with that of earthquakes, greatly as the latter impress the popular imagination. Like artillery in warfare, their moral effect is out of all proportion to the amount of material damage they cause.

Apart from the magnitude of the disaster, popular interest and popular alarm were excited by the short interval which separated it from the great eruption of Vesuvius. People began to wonder whether there was any connection between the two, and whether the world we live in was getting unsafe; this wonder found its reflection in numerous articles in the daily press, and in interviews with a number of persons whose opinions for and against the existence of a direct connection between the two catastrophes have been reported. As we have, in almost every case, only the interviewer's version of these opinions, it would not be fair to quote them, but the matter is one of considerable interest, and it may be well to point out what can and cannot be known regarding it.

Volcanic eruptions and great earthquakes differ radically in their immediate cause. Small earthquakes may be due to any cause which can start an elastic wave-motion in the Earth, but the really great earthquakes, so far as is known, are always started by the sudden fracture of the solid crust of the Earth. In some way not fully known, though probably it is more or less directly connected with the gradual cooling of the Earth, the Earth's crust is thrown into a state of strain which ultimately grows too great to be borne, and fracture takes place. Where the power of resistance is small, the accumulated strain is also small, and so, too, the resulting disturbance; but where the power of resistance is great, the strain also becomes great before yielding at last takes place, and then the disturbance, often accompanied by permanent displacements of the ground, carries destruction in its wake. The occurrence of a really great earthquake means, not only a greatness of force, but also of resistance; it is due to the disruption of solid rock.

In a volcanic eruption the conditions are radically different. Here, too, much is still unknown, but it is certain that an active volcano means the existence of a large body of molten rock, either actually in a fluid condition, or at such a temperature that only a relief of pressure is necessary to make it pass from the solid to the fluid state. It must not be supposed that this fluidity is due to heat alone, the magma is permeated with water, and the condition of the lava in the volcano's neck is a sort of compromise between fusion pure and simple and aqueous solution; but however its state may be defined, the important point is that the rock immediately concerned with the cause of the eruption is virtually in a liquid state, while that which is directly concerned with the production of great earthquakes is virtually solid.

In view of this radical difference in cause and in effect, it seems at first sight as if there could be no connection between the two; seismologists have, in fact, recognized that the neighbourhood of active volcanoes is not specially liable to earthquakes, though the

disturbances which accompany or precede a volcanic eruption may start tremors of that nature, and the districts where earthquakes are most frequent and most violent are always removed, and often far removed, from active volcanoes. The absence of direct connection of the nature of cause and effect between these two classes of phenomena does not, however, preclude the possibility of both being consequences of a common cause, which has been described as the reaction of the interior on the exterior of the Earth, a phrase which will be found in many text-books of geology, and of which we may say that it represents a reality whose precise nature and limitation we are unable to define.

Whatever the character of this reaction, its manifestation is certainly liable to periodic variation; the last twelvemonth has been one of more than average frequency of great earthquakes, and has witnessed more than an average, though not an exceptional, development of seismic and volcanic activity. The Kangra earthquake of April 4, 1905, the two Central Asian earthquakes of July 9 and 23, the Colombian earthquake of January 31 last, and the San Francisco earthquake of April 18 were all disturbances of the greatest magnitude, but the total amount of seismic activity was probably no greater than in 1897–98, and there is no indication of any spreading out of great earthquake centres from the regions whence they commonly originate. The distribution of earthquake centres is curiously localized, and those of the greatest earthquakes are limited, so far as experience goes, to certain areas which do not cover more than, at most, 5 per cent. of the Earth's surface. Great Britain lies well outside any of these regions, and, so far as our country is concerned, there is no reason to anticipate the slightest probability of an earthquake such as led to the destruction of San Francisco.

Our knowledge of this earthquake is at present dependent on newspaper reports, and the facts, so far as they can be gathered with any certainty, have been noticed elsewhere in this *Journal*, but a few words may be devoted to the position of the origin of the earthquake. At first the tendency was to place it under the sea, as nearly all the great earthquakes of the west coast of America have submarine origins, and Dr. Davison, writing in *Nature* of April 26, has drawn the same conclusion from a comparison between the time of the earthquake, as given by the newspapers, and the time at which the disturbance was recorded on European seismographs. As we do not know what the probable error of the newspaper time may be, we cannot attach great weight to this deduction, and there are indications that the centre of the disturbance lay not far from San Francisco itself. The breakage of the water-mains, the consequence of which was so disastrous, could hardly have taken place at a distance from the epicentre; it implies a displacement of the ground and alteration of levels, which might be produced by landslides, but otherwise would only be produced near the origin of the earthquake, where there is often a permanent displacement of

ground-level, as opposed to the temporary molecular displacement in the region over which the disturbance is propagated as wave-motion. The extreme violence of the disturbance, as evidenced by the nature of the destruction of the buildings at Palo Alta, and the narrow localization of this extreme violence, are phenomena which characterize the epicentral region, taken in conjunction with the reported production of a surface fault in the Red hills close by, point to the conclusion that the centre of this earthquake lay under dry land to the south and south-eastward of San Francisco, and not under the sea.

There is another aspect of this earthquake which we hope will find a historian. The story of San Francisco during the weeks which followed the earthquake is not only full of the usual tales of heroism and cowardice, of self-restraint and licence, which repeat themselves when the social system becomes disorganized, but is also full of interest for the sociologist, and therefore also for the geographer. We have seen how a large and highly civilized community has, by the sudden destruction of the whole machinery of that civilization, been temporarily driven to the primitive methods of forced labour and artificial regulation of prices, and the history of the fall and rapid resurrection of the city of San Francisco, as a social organization, will form one of the most interesting and instructive episodes in the history of the world if it is fortunate enough to find its historian.

R. D. O.

RUWENZORI.

THE following note and letter are taken from the May number of the *Alpine Journal*:—

On February 16 Messrs. A. F. R. Wollaston, R. B. Woosnam, and R. E. Dent, starting from Bujongolo (12,660 feet), reached the foot of the Mubuku glacier in two hours. They followed the edge of the glacier to 13,560 feet, then turned away to the rocks on the right, up a steep gully full of loose stones, water, and moss, to about 14,000 feet, then sharp back horizontally on to the glacier near the beginning of the icefall. Thence, keeping near to the base of the rocks on the right (true left of the glacier), by an easy slope to the watershed at a point called by Herr Grauer "King Edward's rock."* Herr Grauer reached the same point on January 18, 1906, by a somewhat different route. View down into the Congo side mostly obscured by clouds. Rocks between 13,500 feet and 14,000 feet not difficult, but dangerous, owing to loose stones and water. Numerous avalanches falling from Duwoni peak, on the right; can be mostly avoided by keeping towards the middle of the glacier. Time from Bujongolo to the ridge in wet weather, five and a half hours.

On February 17 Messrs. A. F. R. Wollaston and R. B. Woosnam, starting from Bujongolo, left the Mubuku valley half a mile above the camp, following the first stream that comes in from the left. Over a low hill into the valley coming from the Kiyanja glacier. Three hours through trackless swamp and moss and

* 15,100 feet by aneroid, 14,956 feet by boiling-point thermometer.

bushes of everlasting flowers. Crossed the stream coming from Kiyanja glacier, about 13,500 feet. Thence up a steep gully to the left (west), and on to loose boulders and screes at 14,000 feet. Turning north, good granite rocks were reached at 14,800 feet, which led to the glacier on the south-west side of the mountain at 15,500 feet. Thence up over easy ice and snow to Kiyanja peak—16,125 feet aneroid, 16,000 feet by boiling-point thermometer. The last three hours in dense fog, which misled the party to the lower of the two tops of the peak. At the moment of starting to descend, the true top, a snow-mound connected with the point reached by a short snow *arête*, was seen to be, perhaps, 150 feet higher. There seem to be no higher peaks than this on the Uganda side of the range, but at least three on the Congo side—one north-west, about 16,800 feet, and two to the north (? Saddle mountain), perhaps 17,000 feet. Rocks easy and good going. Moss and bog at the foot of the mountain very heavy and tiring. Time from Bujongolo to the summit, about six hours.

A. F. R. W.

A private letter from Mr. Woosnam adds some interesting details as to an earlier expedition.

"Ruwenzori, February 2, 1906.

". . . I have been away with Cruthers for a ten days' expedition up to the snow, and missed the mail. It is absolutely the most extraordinary country up high that you can think of. Look at Sir H. Johnston's photographs of high ground; they are good. I have now been to the exact places and seen the same things, and taken photographs of them. Most extraordinary, but a photograph can't give any idea of such a place, nor any description on paper. I will tell you all. It is beautiful, and terrible, and delightful, and yet horrible. The extraordinary vegetation—forest, then bamboos, then giant heather and bog, all hanging with long grey lichen, masses and yards of it, and half covered up in soft deep moss and what R. calls 'rot of ages' (right too), and the great tall thin posts of lobelias, taking many years to grow and die (I am sending you good dry seed of them); then higher, at 12,500 feet, only moss and lobelias and huge trees of groundsel left, and then the lobelias go, and only groundsel and moss and everlasting flowers, and at last only moss and glacier and snow, and, highest of all, rock.

"We have got some glorious new birds from high up, just below the glacier—most surprising and unexpected birds and animals. It was a little cold, but not very; but we had remarkably fine weather, *no rain* and little mist.

"We did a surprising thing. We also reached the watershed, the same point reached by Grauer and the missionaries, and this is how it came about: The first morning after we got up and camped at 12,500 feet, being a fine day, we started early to walk up to the glacier, to have a look at it and see what birds were there. There were very few birds here—in fact, few above 10,000 feet. When we got to the foot of the glacier, we took the spoor of Grauer's party, which was still quite fresh, and followed it up the rocks on the right (the true left) of the glacier. We soon came to a place which is described in Sir H. Johnston's book* as a 'tunnel.' Here we found no less than seven ropes hanging down, of different sizes. It is not really a difficult place to climb, so we took most of the rope back to camp with us on our return. The place is not a tunnel cut by water through the rock at all, but a great flat stone fallen across or lying across a water-worn crack or channel. After we had gone up about 500 or 600 feet we lost all traces of Grauer's party at

* 'The Uganda Protectorate,' vol. 1, p. 184.

a point where they had left a tin with their names the first day. We knew that they had gone up the rocks higher than this before getting on to the snow, but the glacier looked to me to be quite climbable if a few steps were cut in it; but C. wanted to keep to the rocks, so he went to try the rock, whilst I tried to get up the glacier; and, with the help of my hunting-knife, I cut about forty or fifty steps in the ice and got up on to the middle of the glacier. By this time C. had got as far as he could go in the rocks, and came back to where I had got on to the glacier, and tried to follow me up, but failed here also. I was so afraid of mist coming on and spoiling the view from the top—for I could see now that, unless there was a crevasse, I could easily walk right up—that I could not go back to show him the way. So I just walked right up the snow to a black rock on the ridge; and when I got there (it was hard work breathing) I found I had got to Grauer's highest point (my aneroid read 15,100 feet), and found a tin with the three names (Grauer, Maddox, and Tegart); so I put my card into the tin too, with a rifle-cartridge.

"I had a fairly good view over to the Congo side, and took some photos (the first that have ever been taken, as it was misty when they were here). They called this rock 'King Edward's rock.' There is a little lake down below on the Congo side, probably unknown. I could not, of course, see very far, as there were more hills beyond, but lower, and undoubtedly I was on the watershed. I might have gone on to a higher ridge on one side, but I was a bit tired with the altitude, and wanted to get back to C., as we had a long way to get back to camp before dark, so decided to turn back. I came down pretty fast, sliding over the snow, and sliding or falling down most of the glacier, for the steps I had cut had melted nearly away. I found C., and we had some lunch and returned safely to camp. My opinion is this: that there is no point on Ruwenzori higher than 17,500 feet; that the highest point is bare rock, not snow; and that on a *fine* day it is not hard to climb to the top, but on a rainy and misty day it must be awful. We were lucky, and had fine dry weather. My aneroid read 15,100 feet, but that is about 150 feet too high, for Grauer took the same point by boiling-point and made it 14,956 feet."—R. B. W.

Mr. D. Freshfield adds the following note:—

"Mr. Wollaston, it will be noted, has, as I foresaw, conclusively disproved Mr. Tegart's suggestion that Herr Grauer's rock is higher than Sir H. Johnston's Kiyanja. With regard to the lofty peaks on 'the Congo side' of the range noticed by Mr. Wollaston, it is quite possible that the double summit, of which I had a distant view from Butiti, may lie (like the Orteler) near, but off, the watershed, and not be identical with Johnston's and Wollaston's Duwoni. But the photogravure and panoramic plate of the range from the west, published by Dr. Stuhlmann, show no detached and lofty spurs running out towards the Semliki. There are obviously plenty of topographical questions left for investigation by the British Museum party and the Duke of the Abruzzi's Expedition. I regret to hear that there is trouble with the natives in the district at present administered by the Congo State on the western side of the mountain, which may probably hinder exploration.

"D. W. F."

DR. SVEN HEDIN IN PERSIA.

WE give the following extracts from a letter from Dr. Sven Hedin, dated Seistan, April 14:—

When I decided to take the route out *viâ* Turkish Armenia, Persia, Seistan, and Baluchistan, it was only that I should not miss the opportunity of seeing

those countries, and get a vague idea of what they are like during a rapid journey. I should cover those 3000 miles in a hurry. So I did from Trebizond to Teheran, but from there to Seistan it has been serious work, and I have never during all my previous journeys worked so hard as from Teheran to Seistan. It is no exaggeration at all to say that I have been at work sixteen hours a day. You may imagine, therefore, how very satisfied I am with the results. I have written 1200 pages of notes and geographical observations, *i.e.* one-third of what I wrote during the whole of my last expedition, which was 3600 pages of exactly the same kind. If I go on like this for the future, I shall bring back much more material now than in 1889-1902. Further, I have mapped the route in 162 sheets, in the same way as during my previous journeys, and I have had many occasions to make very important corrections on our latest maps of the interior of Eastern Persia. It is a complete mistake to believe that this country is well known, and that trained travellers would have little to do. My plan was to cross Persia in two months, and I have been three and a half on my road from Teheran, and now I have the feeling that I have left behind me years of hard work in the Persian deserts. By no means had I an opportunity to do all that I should like to do. I continued as long as possible, and it was only the heat which compelled me to go on at last straight to Seistan. And now it is a half-done work I have left behind me; that is to say, the itinerary and everything around it is well and thoroughly surveyed, but I should have been able to carry out twenty side expeditions to right and left if I only had had time. The Great Kavir fascinated me for a time. It is the bottom of a big inland lake, full of salt mud, level as a sheet of water; not the smallest ridge of hill is to be found there. My route went down from Veramin to Siah-kuh and Kuh-i-Nakshir, where I got the western "shore" of the Kavir sharply drawn as any strand-line; then I crossed a branch of the Kavir between the great salt desert and the Hauz-i-Sultán lake and its Kavir. Further, I went to Ashin, Alam, Chupunun and Jandak, where I left the whole of my own caravan and the Cossack escort given me by the Shah, and hired four camels and took two men with me, and crossed (without tent) the great Kavir, 30 farsakhs to Payestun, whence I went north-east to Turut. Then we continued south 40 farsakhs once more through the great Kavir, of which I am able now to make a very good map—of course, using all the native information I have got from all around its boundaries and all previous exploring material. The season was rather unfavourable; there was a good deal of rain, which made it extremely difficult for the camels to walk in the salt mud, and I had to do most of it on foot. Arrived in Arusun and Khur, we continued on to Tabas, one of the most charming oases I have ever seen, with real forests of palm trees. From Tabas I went to Parvadah, and made a trip of a couple of days into the Bahab-ad desert ("unexplored" in the latest English map), and turned eastwards to Naiband, which is much more charming than Tabas- that is enough to say. I had from Teheran fourteen camels of my own, of which two were left, but I usually hired six or eight camels also for carrying the camels' supplies. Now, in Naiband it was very hot weather, and as the great Lut is waterless all over, I would not have the camels to suffer in this desert, and I was already one month and a half delayed, and so went on to the east *viâ* Sar-i-chah to Neh, and thence to Nasratabad.

I have collected two hundred specimens of rocks, and at two places I have found fossils—no good specimens, but, as I hope, sufficient for fixing the horizon. At every camp (sixty-eight) I have made a panorama sketch of the surrounding mountains, if there were any, which happened to be the case at about fifty camps. Most of the panoramas are 2½ metres long, and some of these are coloured. I had seldom time to colour them, but in this case made annotations as to the natural

colours. This is a branch I have never tried before—at least, not on the same scale as now, and I am glad to hear from the British officers here, when I have showed them, that they give a wonderful good idea of what the country is like. Anyhow, I have drawn them *con amore*. Then I have taken more than a hundred portraits (pencil drawings) of natives, much finer and more elaborate than those you will find at the end of vol. iv. of 'Scientific Results.' This has also been a great pleasure to me—they give a good idea of the East-Persian type. And last, but not least, I have taken some four or five hundred photos—hundreds of which I developed in Tabas.

Dr. Sven Hedin speaks in the highest terms of the services rendered him by Major Sykes, and of the kindness of British officials in Seistan and elsewhere. He was to leave in two days after the date of his letter for Simla and Tibet.

REVIEWS.

EUROPE.

Mediterranean Sketches.

'Mittelmeerbilder.' Von Dr. Theobald Fischer. Leipzig u. Berlin: B G. Teubner 1906. Pp. vi., 480.

The well-known authority on the Mediterranean basin, who is Professor of Geography at Marburg, has collected together, from various journals, a number of short articles written during the past five and thirty years. A good many of them are political. All are based on actual visits to the lands with which they deal, namely, North-West Asia Minor, the Balkans, Palestine, Southern Italy, Sicily, Corsica, Southern Spain, and North-West Africa. All, moreover, are of a popular nature, and are republished without references or maps, but with a fairly full index. The most interesting at the present time are perhaps those on the "Geographical and Ethnographical Basis of the Eastern Question" (concerned, however, only with the Balkan lands), some sections on Palestine (we note that the author accepts both the Rift theory of the Ghôr and the reality of the convulsion which overwhelmed the Cities of the Plain), and those on Morocco and the French action in Algeria and Tunisia.

An Englishwoman in Russia.

'Russia: Travels and Studies.' By Annette M. B. Meakin. London: Hurst & Blackett. 1904. Pp. xx., 450. *With Maps.*

One has learnt to expect something beyond the ordinary narrative of a traveller from Miss Meakin. Even though she may not deviate from the usual lines of communication, she makes opportunities, and uses them to the full, of observing unfamiliar aspects of life in places that are superficially well known (so far as that can be said of any part of the Russian Empire). In the present interesting volume, for example, she details visits to St. Petersburg, Tver, Moscow, Novgorod, Kharkov, the Crimea, Odessa, Kiev, and the Caucasus, and other places and districts of familiar name. In a case of this kind, the customary account of things seen might have become wearisome. Miss Meakin's is wholly the reverse. For example, at certain points we meet with a close inspection of the conditions of life in some of the great factories; this is one of many instances where Miss Meakin has penetrated beneath the crust of general knowledge about Russia. And it is not to be

supposed that her journey was confined to these well-known cities and districts. She describes such interesting towns as Pskov, for instance, whereof no more than the names (if even these) will be familiar to the majority of her readers. Throughout, the duplication of descriptions by former writers is avoided as far as may be, but, on the other hand, the authoress judiciously draws on authorities for historical notes to enhance the value of her own record. Finally, there are important passages in her book which will attract at once the geographer and the ethnologist. Such are her treatment of the distribution and characteristics of the Finns, of the German "colonists" also, and the distinctions of habit and temperament between them and the Russians, together with the interesting little sketch of the Setukese Ests. The maps accompanying this excellent volume are merely diagrammatic, but there are satisfactory reproductions of good photographs.

ASIA.

Moslem Geographers on Western Asia.

'The Lands of the Eastern Caliphate' By G. Le Strange. Cambridge Geographical Series. University Press. 1905 Pp. xvii., 536

The learned author of 'Palestine under the Moslems' and 'Baghdad under the Abbasid Caliphate' has continued his indefatigable labours with a summary of the Moslem authorities for those Asiatic provinces of the Caliphate which lay outside Syria and Arabia. He terminates his survey with the conquest of Timur. So far as the book goes, it will be an invaluable aid to historians, not only of Islam, but of the Byzantine and Sassanian realms. The pity is that the author was evidently prepared to make it go farther, had it been possible to find means of publishing all his material. Is it out of the question for the Cambridge Press to increase our debt by issuing a supplementary volume of documents, *e.g.* itineraries? The material, which Mr. Le Strange summarizes, is so little known, and much of it is so difficult of access, that the usefulness of his book would be multiplied tenfold if he could set before us his evidence as well as his conclusions. Again and again he refers to itineraries, etc., in which he says the mass of the entries are unrecognizable, and therefore of no avail to him. But there is often wisdom in a multitude of counsellors; and if those who have made a special study of, *e.g.*, the Byzantine geography of provinces which passed under the Caliphate, had those lists to puzzle over, it is at least possible that many of their riddles might be read after all. Such an addition is the more desirable because, owing to the brevity necessarily imposed on Mr. Le Strange by the inclusion of his book in a student series, we are often left uncertain whether statements are merely transcribed from the Moslem geographers, and given on their authority only, or whether Mr. Le Strange intended to criticize and control them. For instance, on p. 147 it is stated without comment, "Tûkât lies to the west of Nîksâr, on the road to Amâsîyah." Is that what the Moslem geographers say? Very likely; but it can never have been correct. The ordinary road from Niksar to Amasia goes nowhere near Tokat, which lies some 20 miles south; but, of course, an official post service may have made this long *détour*. We should like to see the documents. Again, on p. 129, we read, "The fortress (of Hârûnîyah, one march west of Mar'ash) lay in a valley to the west of the Lukkâm mountains, a name by which the Moslem geographers roughly indicate the chain of Anti-Taurus." But in what sense is "Anti-Taurus" here used? No present usage will include mountains one march west of Mar'ash. These must be either the Eastern Taurus or Amanus. Does Mr. Le Strange mean one of these ranges? If so, it is either a new or a very "rough" use of "Anti-Taurus." On p. 133 the Lamos river, once the Arab frontier towards the Byzantine Empire, is said to lie "one march" westward

from Tarsus. One is curious to know in what sense "march" is used; for the distance as the crow flies is 50 miles, and by any practicable road, something more. So, here and there the student, in reading a section of Mr. Le Strange's book on which he has any special knowledge from other sources, is checked by statements which conflict with that knowledge, but are very probably justified as transcripts from the Moslem authorities. For example, are Davalû and Ḳarâ Ḥiṣâr of Nigdah really given by those authorities as distinct places? They are one and the same at the present day. On what ground is Abulustân or Al-Bustân (Byzantine Ablastha) equated with Arabissus, which lies 10 miles west of modern Albistan, and survives, name and all, as Yarpuz? Why, again, if Barbarossa was drowned in a river near Selefkeh, should it be in the Lamos, 20 miles away, rather than, as has always been supposed, in the greater stream, the Calycadnus, which flows by the town itself?

In picking out these little points, we intend not the smallest depreciation of a book which we regard with profound respect, and hail as an invaluable aid. We wish only to illustrate the immense service which an additional volume would render if it put the author's documents also before us. As Mr. Le Strange's book stands, it is rather of the nature of a *Fuhrer* through the maze of Moslem authorities—an index *raisonné*, for which we can only be devoutly thankful, as an instalment; for no one else, writing in our own tongue, could have given it to us. To any one who has worked at the earlier geography of any part of what became the Moslem empire, without consideration of the Moslem geographers, it is full of new lights and revelations of one's ignorance. Why has there been so much dispute about the true derivation of the modern name of Ephesus, Ayâsulûk, if all the time, as Mr. Le Strange now tells us, that name was also written *Ayâthulûk*, which implies, on the face of it, Agios *Theológos*, not *Loukas*, still less any Turkish word like *Suluk*? Such is one very minor count in the debt under which the author and his publishers have laid us, and we can only congratulate both on the production of a piece of scholarship so creditable to British learning, while, at the same time, we venture to reiterate a humble but insistent request for more.

AFRICA.

EGYPT.

'The Making of Modern Egypt.' By Sir Auckland Colvin. London: Seeley & Co. 1906. Pp. xiv., 428. *Portraits and Maps.*

This able and authoritative account of Lord Cromer's proconsulship by one who has co-operated with him on the all-important side of finance, hardly touches geography except when it deals with the Sudan. There are certain aspects of the making of modern Egypt, indeed, which might fairly claim the attention of geographers, notably the modification of the natural conditions by the recent developments of irrigation. But the author passes very rapidly over the history of the dams, even that of the original barrage, and hardly deals at all with the Delta reclamations. Nor does he go in detail into the effect of these and other British achievements upon the Nilotic peasantry. He is content to leave these matters to be gathered from Lord Milner's book and others' (*e.g.* that of Mr. Silva White), and proclaims his own task to be rather the history of the administrative machine at headquarters. But when he comes to the present condition and future of the Anglo-Egyptian Sudan, he dwells more on problems which are essentially geographical, such as the utilization of the Gash and Atbara rivers, the question of the *sudd* and the marsh area south of the Sobat, the present distribution and future expansion of Sudanese products, the actual state of Sudanese population,

and the development of railways and other means of communication. He does not seem to regard the proposed new cut of some 400 miles from Bor to the Sobat mouth as yet within the range of practical politics, while at the same time he is fully aware that the utmost which sudd-cutting operations will ever achieve is only a very slight amelioration of the conditions. In fact, the labours of Major Peake and others have had more relation to making the White Nile navigable than to increasing the summer flow down into Egypt. If the marshes are ever drained, or even greatly diminished, it remains to be seen whether the rainfall in the upper Nile basin will be affected by the contraction of the evaporative area, and whether a serious loss in that way will have to be set against the gain from the freer flow. The re-conquest of the Sudan is too briefly described by the author for any light to be thrown on military geography, but there are some illuminating passages concerning the whole Gordon episode. Having to write largely about the work of living men, Sir Auckland Colvin has to refrain almost entirely from criticism, and this fact should be borne in mind by any who are inclined to carp at the almost unrelieved optimism of the book.

AMERICA.

Argentine Republic.

'Geografía Argentina; Estudio Histórico, Físico, Político, Social y Económico de la República Argentina.' *With Maps.* Por Carlos M. Urien and Ezio Colombo. Royal 8vo, 688 pp. Buenos Ayres: 1905.

'Geografía de la Provincia de Córdoba.' Por Manuel E Rio y Luis Achával.' Official publication. 2 vols., royal 8vo. Vol. 1, 668 pp.; vol. 2, 569 pp. Buenos Ayres: 1904.

The first-named work, replete with information regarding the Argentine Republic, treats of the history of the country, its limits, political divisions, commerce interior and exterior, finances, railways and river navigation, literature, fauna, geology, orography, and, in fact, nearly every subject which can interest those who take an interest in the past and future of that remarkable land, which is now so attractive to the European emigrant.

Each province is extensively described in detail, and its agricultural and pastoral products, climate, orography, hydrography, limits, area, and industries are well outlined. The whole volume presents evidences of having been prepared with the greatest care with a view to making it a standard work.

It is not usual to find the provincial governments of South American nations paying such marked attention to geography as is indicated in the two voluminous tomes supplied by Sr. Achával. They do credit, not only to the governor of the state, but to the civil engineers who have collated and classified the vast quantity of information they contain in great detail, and upon almost every imaginable subject which can be included under the name of geography. The work shows ample evidence of having been written with that accuracy due to its serious nature, and is replete with facts and valuable statistical data regarding one of the most beautiful, diversified, and interesting provinces of the Argentine Republic.

South American Ethnology.

'La Edad de la Piedra en Patagonia.' By Felix P. Outes. Buenos Ayres: 1905.

By this masterly treatise on 'The Stone Ages in Patagonia,' which forms the twelfth volume of the *Anales* of the Buenos Ayres National Museum, Señor Outes has supplied a want that has long been acutely felt by students of primitive man

in Austral America. Much had, no doubt, been written on the subject by several competent observers, such as Moreno, Ameghino, Lovisato, Hyades, Martin, Ambrosetti, Burmeister, and others; but these pioneers all worked independently of each other, and their essays lie for the most part buried amid official records, or scattered over scientific periodicals scarcely accessible to the general public. But here we have at last a splendid monograph, which covers the whole ground from the Rio Negro to Tierra del Fuego, and offers reasonable solutions of the many obscure problems associated with the advent and evolution of early man in those southern lands.

Despite its great size (over 300 quarto pages), the author assures us that the volume forms but a mere fraction of a comprehensive work which he had intended writing on *Los primitivos habitantes de Patagonia*, but had to give up owing chiefly to the impossibility of first surveying the whole field for himself. Hence this instalment is merely to be regarded as a descriptive and comparative study of the rich archæological materials contained in the numerous public and private local collections available for the purpose. These remains have all been most carefully examined, their provenance verified, and their value thus thoroughly established as primary factors in the attempt to unravel the tangled history of human origins and culture at the southern extremity of the New World. The work, which is throughout conspicuous for systematic treatment and scrupulous care in the study of details, is disposed in three sections, with a *résumé* (in French), followed by analytical, geographical, and general indexes, a long list of authorities forming a nearly complete bibliography of the subject, and a most useful archæological map of Patagonia, clearly showing by various graphic devices the sites of stations, workshops, burial-grounds, caches, and other isolated finds between the Rios Negro and Gallegos (40° to 52° S.).

In the first section, "The Physical Environment," geographers will find an ample account of the whole region, its geology, flora, fauna, climate, hydrography, and areas of dispersion, with special reference to its early and later inhabitants. Here a full account is given of the present Patagonian groups, their somatic and psychic characters, speech and numeral system, religious views and practices, social usages, funeral rites, constitution of the family and the clan, with general "anthropo-ethnological conclusions."

Then follows Section II., "The Palæolithic Period," in which, against northern scepticism, the author unreservedly admits the presence of Quaternary (Pleistocene) man, recognizes eight undoubted palæolithic stations or deposits, and determines two Pleistocene types—a brachycephalic arriving from the north-west, and a dolichocephalic from the north-east. On this crucial point Señor Outes writes, "The palæolithic deposits so far met number eight, distributed over a wide geographic area between the parallels 43° 45′ and 49° 50′ S., and all lying near the Atlantic coast. In the form of the deposits, the types and technical art of the objects, they belong to the Patagonian Quaternary beds, which belong without any exception to one and the same archæological epoch. On comparing the Patagonian palæolithic industry with the European, we find a great resemblance of forms, etc., with that of the Acheulean epoch—that is to say, with the more finished types of the lower palæolithic." He also finds a striking resemblance to the Egyptian, Tunisian, Algerian, and especially United States (Trenton) palæolithic implements. He thinks, however, that the Patagonian beds yielding palæolithic remains are more recent than the corresponding European formations, which would point at "a later industrial development of the Austral American aborigines."

In Section III., dealing with the New Stone Age, the author distinguishes three separate archæological periods, determined by the different forms of the

permanent stations, by the antiquity of the objects found in them, and by the different technical processes. These periods are fully described and profusely illustrated with reproductions of all kinds of objects—in the whole volume there are as many as 206 of such illustrations—and the author finds, in conclusion, many points of close contact between these Patagonian neolithic objects and those off other parts of America, as far north as British Colombia (scrapers, awls, pestles), and the hyper-borean Eskimo domain (scrapers, knives, darts, and arrows).

A. H. KEANE.

GENERAL.

LIPPINCOTT'S GAZETTEER.

'Lippincott's New Gazetteer: A Complete Gazetteer or Geographical Dictionary of the World.' Edited by A. and L. Heilprin. London: J. B. Lippincott Co. 1906. *Price* 42*s. net.*

This well-known Gazetteer has once more been subjected to a thorough revision, making it the most up-to-date work of the kind now on the market. It is claimed that in its present form it is virtually a new work, the older edition having been used merely as the framework for the new. As far as can be judged from a few preliminary tests, the revision certainly appears to have been carried out with care and thoroughness. Thus under the heading "Chad" we find due record of the fact established by Lenfant, that an intermittent connection exists between its basin and the Benue; while under "Bali" we are correctly informed of the depth of the Bali-Lombok channel as determined by the Dutch *Siboga* expedition. The treatment of newly developed regions such as the Yukon or Rhodesia is satisfactory, while the statistics for the older countries seem equally up-to-date. The method of defining pronunciation cannot, however, be pronounced satisfactory, and no attempt seems to have been made to bring it into line with other modern systems of geographical spelling. In spite of the large (perhaps unnecessarily large *) number of special signs employed, various sounds which to a critical ear are really distinct, are not discriminated. Thus, though different signs are used for each of the vowel sounds in the words "berth," "birth" and "fur," it is thought unnecessary to distinguish between the sounds in berth and ravel, in "b*i*rth" and "ev*i*l," or in "f*u*r" and "t*u*b." No provision is made in the key for the sound of the second vowel in "ravine" (though *ee* seems to be used in the body of the work), while the use of ĕĕ (in addition to ĕ and ĭ) for the sound in "pin," seems a perfectly gratuitous addition to the long list of signs. Again, the distinction between the three possible ways of sounding *ng* might with advantage have been made clearer. But the actual pronouncements on the subject seem generally correct, and, taken all round, the new edition is, like former ones, a distinctly valuable work of reference. It is clearly printed from new type, and the whole has most wisely been kept within the limits of a single volume.

SHELL-CURRENCY.

'Muschelgeld Studien.' Verein für Erdkunde zu Dresden. 1905. Von Prof. Dr. Oskar Schneider, nach dem hinterlassenen Manuskript bearbeitet von Carl Ribbe. Dresden: 1905.

This interesting, but unfortunately incomplete, study traces the distribution, history, varieties, fabrication, and uses of shell-money throughout the world. In

* Symbols that might be needed to show the pronunciation, as is done in some dictionaries, without alteration of the current spelling, are of course superfluous when, as in the present case, the names are re spelt phonetically—a fact which seems to have escaped the editors.

Micronesia the distribution of this form of currency seems to have some ethnological importance, especially as regards the characteristic "gau" of the Carolines (*Spondylus* discs). Various forms are found in the Marshall islands, and were formerly in use in the Gilbert archipelago, but the occurrence in the Ladrones is doubtful. Many characteristic forms of shell-money are found in Melanesia, notably the "diwarra" or "tambu" of the Bismarck archipelago, "pele," "pig-money," etc. Examples are seen in New Guinea, but it is often difficult to distinguish between shell-money and shell-ornaments; and in the Fiji islands, where strings of shell discs have been collected, their use seems to be purely ornamental. It had always been a matter of surprise that a currency should have been evolved in Melanesia and yet be absent in the more cultured areas of Polynesia; so it is interesting to find that traces of shell-money have been cited from Samoa and the Hawaiian islands.

In Africa, as one would expect, the distribution is more general. The *Conus* shell-money is found principally on the West Coast, where the *Achatina* shell-money also occurs, ranging from Senegambia to Benguela. Chains of *Achatina* discs are seen, either as money or ornament, among the Bantu south of the Kuanza, and among the Shuli, Bari, Makaraka, Madi, Wassongora, Wakuma, Wawamba, Wawira, Wakonjo, and Lur.

The most important and widely spread form of shell-money is, of course, the cowry (*Cypræa*). The shells are common in many parts of the Pacific and Indian oceans, and probably were first used as currency in China and Japan. They were in general use in India; they are found in prehistoric graves in Europe, and had reached the West Coast of Africa in the fourteenth century.

Unfortunately, the record of shell-money in America consists only in a few notes and some admirable illustrations, and it is sincerely to be regretted that the author was not able to complete his careful and valuable study.

THE MONTHLY RECORD.

EUROPE.

The Scandinavian Main Water-parting.—In the *Norsk Geologisk Tidskrift*, vol. 1, No. 1 (Christiania, 1905), Dr. Hans Reusch points out a peculiarity in the main water-parting of the Scandinavian peninsula in that it does not run in irregular windings, but in regular scallops, concave towards the Atlantic ocean. The reason for this must be, in his opinion, that the rivers flowing in that direction have worked more powerfully than those flowing east and south, and have, therefore, pushed their basins eastward at the expense of the latter; the Glommen affording a striking example of a river of the eastern system whose upper basin has been encroached upon by its neighbours on the Atlantic side. The eastward shift of the divide is also proved by the occurrence of "hook-valleys," *i.e.* tributaries which unite with the main stream at an acute angle with the course of the latter below the junction, thus proving that they have been captured from an adjoining river-basin on the opposite side of the divide. Some small tributaries of the Rauma and Aura in the Romsdalen district are cited as instances, but the phenomenon is seen in various quarters, including the northernmost part of Norway, and, apparently, the Kola peninsula. The greater power of the western rivers may be due, not only to their steeper courses, but to the greater volume of water on the Oceanic side, while the action of the ice in the glacial epoch may have also contributed to bring about the said result.

The Tegern-See.—An interesting article in *Globus* (vol. 88, No. 23) traces the history of the Tegern-See in Bavaria from earliest geologic ages through human and political record down to modern times. In the environs of the lake there have been found no traces of prehistoric man, whether dwelling-places or graves, but only a few bronze hunting-weapons, lost, it may be conjectured, by hunters venturing into this district out of neighbouring inhabited regions. On the north side, at no great distance, grave mounds are found at Henfeld, Bruckmühle, and Aibling, in some spots on the right bank of the Mangfull, by Vallir, Gotzing, etc., all outside the lake region proper. Nor did the Romans approach nearer. There are remains of a Roman country house at Machtelfing on the Würm-See, of a villa on the Deixelfurt-See, a Roman entrenchment above Grünwald, military camps at Deisenhofen, but the Roman settlements selected the main arteries of intercourse, and the displaced pre-Roman population retired to the more distant regions. Not till the Bajuvar Germans, on the collapse of Roman rule, migrated, about the turn of the sixth century, into Rhætia and Noricum, was the Schlier and Tegern-See region gradually peopled and opened to human culture, and that only by slow stages. Whereas in some districts of the fruitful foreland places with the patriarchal "ing" ending, denoting the oldest Bavarian settlements, lie thick as meteoric clusters, only one, Scharling, has strayed into the Tegern-See region. Gotzing, to the north, belongs to the foreland. Both these places may be relegated to pre-Christian time. Place-names, on the other hand, in "reutin," "roden," "schwenden," or indicative of landscape and situations by woods, waters, etc., may, in view of the late settlement of the mountain region by Germans, be assigned to the Christian age. Of such places a long list is cited, such as Neurent, Gereuth, etc. Later on, when in the eighth century the Bavarian population was converted to Christianity, and monasteries and churches founded, the region advances into the light of history. In 756 a basilica and cloister were founded in the locality by Adalbert and Otkar. The cloister developed into an abbey, grew in wealth, and in the time of Duke Arnulf is said to have owned 11,000 hides, besides possessions in the Tyrol and Austria. In the twelfth century its abbots were imperial princes. But the record of the mediæval and later associations of the Tegern-See cannot be touched upon here.

ASIA.

Journeys in Central Asia.—Prof. Ellsworth Huntington lately passed through London on his return to America from the expedition to Central Asia, on which he set out in the company of Mr. R. L. Barrett early last year (*Journal*, vol. 25, p. 127; 26, 451; 27, 177). After separating from his companion at Keriya in the autumn of 1905, he started on a journey round the east side of the Lob Nor basin, which proved an adventurous one in some respects. The route led for four days over a vast salt plain, the surface of which resembled that of a frozen sea or petrified ploughed field, being formed of blocks of salt as hard as stone, into which the floor of an old lake-bed had broken. The caravan, consisting of four men with five camels, found the passage of this plain exhausting work. All this region was absolutely desert, and among its surface-features were miniature tablelands of clay rising abruptly from the plain like the "Mesas" of the arid region of North America. Intense cold was experienced, the average temperature being 2° below zero Fahr. during the whole march from Charklik to Tikkenlik, near the Tarim. At a point north of Lob Nor four of the camels were enticed away by wild companions, and it was only by the devotion and determination of one of the men that they were recovered, and a serious position retrieved. The further route led across the Kuruk Tag mountains to Karashar, important rectifications of existing maps being made, while a number of ruins were discovered along an old bed of the Tarim. After

a visit to the Turfan depression in the north-east, Prof. Huntington began his homeward journey. Another interesting journey across Central Asia has lately been made by Colonel Bruce, commanding the late Chinese regiment at Wei-hai-wei. Accompanied by Captain Layard and a native surveyor, he left Leh on August 29, 1905, and crossed Western Tibet and the Kuen Lun range to Keriya, whence he went north-east along the borders of the desert to Cherchen and Lob Nor. The route was continued eastward to the Kara Nor and Sachu, and thence across China to Peking, which was reached on May 6, 1906. It does not appear how far the route deviated from those of previous travellers, but it may be expected that additions have been made to our knowledge in respect of the less-known parts of the country traversed.

Journey from China to India.—We learn from the Calcutta *Englishman* of April 17 that a journey from Tongking and China to India has been made by a young English engineer, Mr. E. C. Young. Passing through Tongking in October last, the traveller entered China at Lao-Kai, and, following the line of the French Yunnan railway for some distance, made his way to Talifu. Frustrated in an endeavour to explore the right bank of the Salwin, he tried to cross the divide towards the Irawadi, north of 26°, but only succeeded on the third attempt, owing to the heavy snow on the passes. He crossed the Nmai-kha and, turning northwards, visited the Kamti Long district, crossing the other branch of the Irawadi, the Mali-kha, *en route*. After great difficulties, the mountains forming the divide between the Irawadi and Brahmaputra were crossed by the Chaukan pass, the route leading through dense uninhabited jungle to the basin of the Dihing, Sadiya being reached on April 9. The country traversed within the Irawadi basin is still little known, in spite of the journeys of Prince Henry of Orleans, General Woodthorpe, and others, so that further details will be awaited with interest.

The Sikhota Alin.—Between the years 1897 and 1901 Y. Edelstein made several excursions into this range, crossing it by five different passes (*Izvestiya* of the Russian Geogr. Soc., No. 2, 1905). Most of the summits rise to 2100 to 2800 feet above sea-level, and many are much lower; the highest, Khualaza, in the south Ussurian district, attains to 5152 feet. In consequence of this comparatively low elevation, these mountains nowhere rise into the region of eternal snow, though the climate is severe and precipitation abundant in winter; indeed, alps are not very common, the mountains being generally covered from base to summit with luxuriant primæval forest. Erosion has been very active, and torrents and rivers score the surface in every direction. The valleys are of two types. Those rivers which run entirely, or for the most part, through granites, schists, and sandstones, flow in winding valleys bordered by heights which, now on this side, now on that, approach the bed of the stream, breaking off in grand cliffs; while those which run through elevated volcanic plateaus have cañon-like valleys. Granites, of remarkably numerous varieties, are found at all elevations, and groups composed almost entirely of these rocks are not uncommon. They occur in all parts of the range, but are most frequent on its periphery, especially the eastern slope. They may have been thrown up near the sea to a greater height on the formation of the chain or in consequence of a rise in the coast. A thick layer of pebbles was noticed at a height of 260 feet near Cape Nicolas, resting on granite and covered with a thin sheet of basalt. Volcanic rocks cover a considerable area in the northern and central Sikhota Alin, both quartzite and felsite porphyries, diabase, etc., and more recent melaphyres, basalts, and dolerites. Crystalline schists and clay slates are also abundant, while limestones are rare.

AFRICA.

African Territorial Arrangements.—By an Order in Council, dated February 16 last, and published in the *Gazette* of the 20th of that month, the administration of Southern Nigeria has been placed under that of Lagos, the whole territory being henceforth known as the Colony of Southern Nigeria. The order was proclaimed in both sections of the territory on May 1, the day being celebrated at Lagos as a public holiday. Arrangements affecting the boundaries of Northern Nigeria have lately been come to in London with representatives of France and Germany as a result of the work of the recent mixed commissions. It is stated that a portion of the Zinder territory hitherto south of the international boundary, has been made over to France. The difficulties which had arisen between this country and the Congo State in respect of the Bahr el Ghazal territories have also been set at rest by an agreement signed in London on May 9, by which the lease of the Bahr el Ghazal to the Congo State, arranged for by the agreement of 1894, but which subsequent events prevented from taking effect, is definitely cancelled, except as regards the Lado enclave, which had always been on a different footing from the rest of the territory (*Journal*, vol. 4, p. 54). As a set-off, facilities are to be given to the State for the construction of a railway to Lado, with the establishment of a commercial port at the terminus; for the free navigation of the upper Nile; and the free transit of passengers and merchandize over the territories of the Egyptian Sudan.

Herr Frobenius' Researches in the Kasai Basin.—A second letter from Herr Leo Frobenius, describing the course of his ethnological expedition to the Southern Congo basin (*Journal*, vol. 26, p. 672), is printed in the *Zeitschrift* of the Berlin Geographical Society (1906, No. 2). In spite of some hindrances, the traveller had carried on fruitful researches, both ethnographical and geographical, in the region of the middle Kasai, a region first brought to light by the now classic labours of Germans like Pogge and Wissmann. He had been able to survey parts of the Kasai itself, in the section which includes the Pogge and Wissmann falls, that had hitherto been imperfectly known, and had brought to light a third imposing fall, which he named after his artist companion, Hans Martin Lemme. He reports that rapid changes are taking place in the character of the Pogge and Wissmann falls, the latter especially having been virtually destroyed since 1888, and become nothing but a heap of *debris*. Great changes have also taken place in the distribution of the population since Wissmann's time. Herr Frobenius dwells on the close relation which exists between the geographical and ethnographic situation, the physical division between the forest in the north and savannah in the south, constituted by the waterfall-line, having its ethnographic counterpart. Wave after wave of invasion has passed from south to north, and the older culture of the Baluba is even at the present day being overwhelmed by the movement of the Kiokwe from the south, which forms a striking instance of the replacement of an old and effete race by a young and vigorous one.

Coast-ledges in Cape Colony.—The subject of the shelves or ledges on the margins of the continents has been much discussed of late, and a contribution to the body of facts that has been accumulating is made in the *Quarterly Journal of the Geological Society* (February number, 1906), by Prof. E. H. L. Schwarz, to whom we owe many recent additions to our knowledge of the physical geography of South Africa. Prof. Schwarz describes some remarkable platforms which fringe the southern coast of Cape Colony, all of which he attributes to marine denudation, though, with the exception of the well-known Agulhas bank, most are now elevated above sea-level. The most striking of the coastal plateaux

is that extending from Caledon to Port Elizabeth at an elevation varying between 600 and 800 feet above the sea. In the west of this area the plateau form is to some extent obscured by the result of erosion, which has furrowed the surface with a labyrinth of steep-sided gorges, with narrow intervening ridges ("ruggens" of the Dutch). But it can be plainly seen that all the ridge-tops are cut to a level which slopes gently to the sea. East of Georgetown the plateau-form becomes much more prominent, the Table-mountain sandstone or granite of which it is composed having been far more resistant than the clay-slates further west. Some have considered this coastal plateau to be a peneplain or base-level of river-erosion, but Prof. Schwarz is confident that it is a plain of marine denudation. He shows that there are other more or less extensive ledges, admittedly surf-cut, at various levels above and below tide-mark along this part of the coast, while further east coast-shelves occur as far as the native territories. At East London there is a remarkable succession of plateaux, each terminating in an abrupt drop, at altitudes varying from 151 to 5450 feet above the sea. In comparing the facts observed in South Africa with those in other parts of the world, the writer introduces a term which will perhaps be objected to by some, viz. "absolute base-level of erosion," by which he intends the extreme limit to which the action of running water has ever made itself felt during the oscillations subsequent to the time when the continents practically assumed their present outline. Such a term is, no doubt, useful as expressing a datum from which to reckon the extent of subsequent oscillations, but the difficulties in the way of its determination must be very great. Prof. Schwarz (who by running water seems to include waves and currents) places it at the base of the steep slope leading from the continental shelf to the ocean floor, and considers that on the European coasts of the Atlantic it is now 9000 feet below sea-level; on the American side, 12,000 feet; while in South Africa it stands at 1200. This shows, he thinks, that while the Atlantic coasts of Europe and America have very nearly reached bottom on the down grade of oscillatory motion, South Africa is on the up-grade and nearly at the top, the far greater maturity in the topography of Europe as compared with South Africa being in harmony with these suppositions. This relation, no doubt, holds good, but that erosion has been effective in recent geologic time to depths of 12,000 feet will hardly be considered as fully established.

Prof. Penck on South Africa.—A summary sketch of the broad characteristics of South Africa, as seen by him from the point of view of physical geography during the visit of the British Association, was given by Prof. Penck in the Vienna Journal *Die Zeit* of April 6, a copy of which we have received from our correspondent, Dr. Poucker. Prof. Penck's observations were, broadly speaking, limited to the wide zone which forms the southern and eastern border of the interior plateau, in northern Cape Colony, the late Boer territories, and Mashonaland. His remarks do not, therefore, apply to the coast-lands between this zone and the sea. He dwells especially on the varying character of the elevations according to the geological structure, distinguishing between the steep-sided table mountains (*Kranzberge*) largely composed of sandstone; the peaked summits (*Spitzberge*) formed by the laying bare of the lava-sheets; the kopjes of further north, often associated with quartzites; and the granite bosses of the Matoppos. A general characteristic, however, is the isolated nature of the mountains or groups of mountains, which greatly facilitates communication throughout the country by the passages always left open between. The whole country is marked by the vast extent of the denudation to which it has been subject, the action of running water or wind having during countless ages removed all but the hardest portions, which now stand out like islands above

the general surface. Referring to the Victoria falls, to the neighbourhood of which Prof. Penck devoted a week of careful study, he fully bears out the views of Mr. Molyneux (*Journal*, vol. 25, p. 40) as to their origin and the causes of the zigzags in the course of the river below. He lays stress on the youthful character of the Zambezi in this region, contrasting the falls with those of the streams in Natal, which have widened their valleys both above and below the obstruction to which the falls are due. He considers that before the present state of things set in the climate must have been drier than at present.

Northern Nigeria.—A Colonial Report (Annual, No. 476) by Sir F. Lugard, on Northern Nigeria, tells of a distressing famine affecting large districts of the protectorate, more particularly Yola and Bauchi, during 1904, involving the sale by famine-stricken parents of their children in large numbers, and leaving many of the people without either corn for the sowing of 1905 or strength enough for the tillage of their fields. Of unusual length, the report is of especial value for its notes on all the provinces, embodying accounts compiled by the respective residents in charge, and observations made by Sir F. Lugard personally during his tour of inspections in 1904, a tour covering a distance of over 2000 miles by land, and over 1600 miles by water, including every province except Sokoto. The report thus supplies a sketch of the history of each province from early times, its present state, social organization, area, configuration, character of soil, climate, products, resources, population, trade, industry, administration, policy, outlook; in short, data of exceptional value for an accurate and comprehensive appreciation of the factors involved in its development. The report comprises, also, an account, from the forestry officer, of the forestry and agriculture of Northern Nigeria.

AMERICA.

The Delta of the Colorado.—An interesting description of the still imperfectly known delta of the Colorado under its various aspects is given by Mr. D. T. Macdougal in the *Bulletin* of the American Geographical Society (New York, No. 1, 1906). The writer was member of an expedition which traversed the delta in 1905, and had paid more than one previous visit in company with Mr. Godfrey Sykes, who has made several independent voyages through the estuary to the Gulf of California, and supplies a sketch-map in illustration of the paper. As a rule, the river runs at a low stage for three-fourths of the year, but with the melting of the snows in May begins to rise, until in June and July the delta is practically submerged. Last year the writer was witness of one of the exceptional floods which occur at long intervals earlier in the year, and cause serious disturbances to all life in the delta. The course of the stream at the present day differs widely from that shown by Ives and other surveyors of the middle of last century, as its cutting action is rapid and continuous at various points on the edge of the Sonora desert on the east. At these points a striking contrast is to be noticed between the swamp vegetation of the water's edge and the xerophytic forms of the desert, for, contrary to what is often stated, the river has practically no power to modify the desert climate of the surrounding region. Within 50 feet of the water, a relative humidity as low as 17 per cent. is often recorded. Last year's expedition verified the existence of a flood waterway which leaves the main stream above tide water, and flows south-easterly into the Santa Clara at the head of the Gulf of California. It formed a navigable stream which might easily become the main channel. Solid land seems to be extending its area at the mouth of the river, where the present Hilda island was noted for the first time in 1890. Islands have appeared and disappeared in a very capricious fashion, the bore, which rushes up the funnel-shaped mouth with great violence, causing great changes. A

considerable portion of the flood water never reaches the sea, but finds its way into the old Salton lake depression to the north-west. The flood of 1905 poured enough water into this to form a lake of 600 square miles, and as the intake is facilitated by irrigation operations, the re-appearance of a permanent lake is not impossible. Another basin below sea-level, west of the Cucopa mountains, is fed by the Hardy, the western branch of the delta, and at the highest floods these mountains are almost surrounded by water. It is, therefore, not surprising they contain many endemic species of animals and plants, while, as the area watered by the river is surrounded on all sides by desert or salt water, it forms in reality a biological island. The Cucopa Indians who inhabit the delta are a dwindling remnant, waging a losing fight against adverse conditions, but with the initiation of civilized methods of irrigation, the rich alluvial lands may become the home of many thousands.

The Geology of Orizaba.—A short paper by E. Angermann, printed in the *Memorias* of the Sociedad Cientifica "Antonio Alzate" (vol. 21, pp. 365–369), describes geological observations made during an ascent of Citlaltepetl, or Orizaba. The base of the mountain rises in steps, indicating the succession of the various phases of eruption to which it owes its origin, but its form has since been modified by erosion. The beautiful conical summit, composed of a compact and hard andesite (amphibolite), seems to be taking more and more, under the agency of erosion, the form of a triangular pyramid. It is difficult to decide whether it rises from an ancient crater; but in any case the Sierra Negra is not such, but represents an independent volcano with its own crater. There seem, however, to be traces of an ancient crater on the east side and elsewhere. The volcanic cones to the north-west of San Andrés Chalchicomula seem to be parasitic in character. The present crater—a deep gulf several hundred feet deep, oval in section above, and with a major axis of little over 300 yards—bears no resemblance to the typical funnel-shaped crater. The author considers the volcano to belong to the monogenic type of Stübel, and to owe its origin to a single eruption of long duration. He does not believe that it rises from a line of weakness of the crust, as might be supposed from its position at the edge of the Mesa Central, apparently bounded coastwise by a line of subsidence. The actual ascent of the mountain, which gives a wonderful insight into the geological structure of the district, negatives this view, and shows that the rampart of the Mesa Central is piled up by the volcanic products of the great mountain. The varying colours of the different formations are taken in at a glance, and the true relations of the latter thus made manifest. The height obtained by aneroid was 18,045 feet, which would seem to be too low a figure, previous more precise determinations having given results between 18,179 and 18,312 feet (cf. *Proc. R.G.S.*, vol. 14, p. 804).

Structural Lines of South America: Rocks at the Madeira Cataracts.—In a paper on the rocks of the cataracts of the Madeira, printed in the *Quarterly Journal of the Geological Society* (vol. 62, part i.), Dr. J. W. Evans begins by discussing the general configuration of the region, and brings together from all available sources such data as throw light on the main directions of the structural lines. He shows that the crystalline rocks, to which the falls of the Madeira and neighbouring streams are due, seem to belong to an important axis of folding and elevation, with a south-east and north-west direction, which apparently extend for 1200 miles—from 14½° S., 59 W. to 4° S., 73° W., near Iquitos, on the Amazon. This direction, parallel to that of the Andes in Northern Bolivia and Southern Peru, seems to prevail also in Southern Venezuela, Guiana, and North-Eastern Brazil, and coincides with the direction of strike so common on the Earth's surface for some distance on either side of the equator, and which seems closely connected with the

causes of the easterly position of the land-masses in the southern hemisphere as compared with those in the northern. It occurs again in the south of the continent, and forms one of the four principal directions of folding or elevation in South America, the other three being—(2) a direction roughly at right angles to the first, seen on the coast of Brazil south of Cape San Roque; (3) an east-and-west strike, seen in Northern Venezuela and the Amazon basin; (4) the north-to-south line of the Southern Andes. With regard to the rocks which form the special subject of the paper, Dr. Evans summarizes the results of his observations as follows: With the exception of comparatively recent alluvial deposits and a few pebbles of chert of marine origin but uncertain date, only crystalline rocks are met with. They all appear to be igneous, mostly massive in character, though some dyke-rocks occur. In places they are typical gneisses, and they are often banded; but in some cases they show no signs of foliation. The black coating found on the rocks of the Madeira cataracts, as on those of so many others within the warmer regions of the Earth (cf. *Journal*, vol. **20**, p. 655; vol. **27**, p. 197), is briefly discussed. An analysis of a small quantity of material scraped from the rock has shown that, as elsewhere, oxides of manganese and iron from the great bulk of the soluble constituents, the former (54·1 per cent. of the whole) being probably a variety of psilomelane (hydrated manganese oxide). Unlike Mr. Lucas (*Journal*, vol. **27**, p. 197), Dr. Evans thinks the film derived form the water, not the rock, saying that he has found large crystals of quartz and felspar coated equally with biotites or hornblendes, while he has also seen crags of white sandstone covered with a jet-black coating, which caused them to resemble basalt. He thinks that manganese and iron oxides are more soluble in river-water in the tropics than in colder climates, but that possibly organic compounds dissolved in the water play a part as well as the higher temperature.

AUSTRALASIA AND PACIFIC ISLANDS.

Exploration in Central Australia.—The journal of two exploring expeditions by the Central Australian Exploration Syndicate, under the leadership of Allan C. Davidson, is published by the South Australian Government as a parliamentary paper (A., No. 27, 1905). The region proper explored measures 11,000 square miles in the northern territory of South Australia, held by the syndicate under special permit from the South Australian Government, between 19° and 22° S., or extending from Barrow creek to Attack creek, a length of 220 miles. Lying east of 134° E., the bulk of the region is also east of the Overland Telegraph Line. Its greatest width, on lat. 20° 50′ S., is 80 miles. The first expedition, to the east of the Telegraph Line, occupied two years, 1898–1900. The second expedition, to the west of the Telegraph Line, started from Kelly's Well, May 5, 1900, and reached Barrow creek September 20, 1900, thus consuming four and a half months. Of the region to the east of the Telegraph Line, occupied almost entirely by the Murchison and Davenport ranges, and containing splendid gorges and some permanent springs, only a small proportion was found metalliferous, and these metalliferous belts, with one exception, were very small. In them were found many gold-bearing reefs, but of so low grade as not to justify the outlay required to develop them. Only with the extension of the railway line from Oodnadata to Port Darwin would the mineral resources of the country suffice to induce the human development of that region. With an elevation of over 2000 feet, the country is well adapted for permanent settlement. Water is abundant, and in the many valleys and plains there is good grazing-land. The region is, moreover, plentifully timbered with gums and other woods. The western expedition, which made more than 200 miles westwards

without encountering any permanent water, and, entering West Australia, reached 125° 58′ E. and 20° 6′ S., travelled 1370 miles direct, or, including the extra walking involved in such prospecting operations, 2200 miles. The area of country traversed, and that proved indirectly to be desert or of no mineralogical value, measured 30,000 square miles, including 4000 square miles of metalliferous belts of granite, eruptive and metamorphic rock, 6000 square miles of sandstone and quartzite ranges, with conglomerates and desert sandstone, and 20,000 square miles of Recent and Tertiary formations, consisting of alluvial plains with sandhills, gravel, travertine, limestone, and conglomerates. In the way of pasture, there is a splendidly grassed country in one block of 500 square miles. Two maps show, one the geographical features and geology of the country traversed, the other the belts of gold-bearing country and the work of the first two years. Altogether, the two expeditions, covering 27,000 square miles, yield a very material contribution to the topography and geology of a space hitherto blank in the map of Australia.

British New Guinea.—The annual report for the year ending June 30, 1904 (Commonwealth of Australia, No. 1, C. 7001, 1905), contains less than some former reports of strictly geographical matter, though some of the visits of inspection made by the late acting administrator, Mr. Christopher Robinson, were of interest from this point of view. Such was an expedition carried out under the guidance of Mr. Monckton, resident magistrate of the north-eastern division, with a view to testing the feasibility of a road from Kotakeura bay to the Yodda valley goldfield. The party wandered for fifteen days through an extremely difficult mountainous country, inhabited by hostile natives, finally emerging at Papangi Government station, fully convinced of the impracticability of a road by the route followed. Subsequently, a surveyor with a quantity of stores was landed at Buna bay to start the making of a road from this point to the Yodda valley. A visit was also paid to an inland lake, situated in moderately flat country between the Mambare and Opi rivers, an interesting feature in which is its depth, ranging from 36 feet immediately under the bank, to 168 feet in the centre, though the area is only about 3000 acres. A tribe named Siagara has here taken refuge from the attacks of stronger neighbours, in houses built on rafts. During visits of inspection in the western division, the administrator was accompanied by Dr. Seligmann and other members of the Daniels Ethnological Expedition, some results of which were outlined in the *Journal* for April. The report discusses the present position and outlook in each of the administrative divisions in turn. The central division, although comprising the earliest settled parts of the possession, includes a coast tract between the Purari and Cape Blackwood, which has not yet been fully brought under Government influence. Port Moresby has been temporarily eclipsed by Samarai, the headquarters and port of entry for the eastern division, owing to the discoveries of minerals in the east and north-east; but as agricultural development progresses, prosperity will probably return to the former. The mountains have only here and there been prospected for minerals, but there is no reason for supposing the south side of the range to be less rich than the north. The hopes formed a few years ago that Murua, or Woodlark island, the headquarters of the south-eastern division, would become a rich gold-producing island, have not yet been realized, but deep sinking has given indications of better things. The excessive death rate among native employés, which is one of the greatest obstacles in the northern division, does not obtain here. In the north-eastern division (where no mining is at present being done) the progress in native administration is reported as wholly satisfactory. In the northern division, the road already alluded to was cut in great part by the rawest of wild savages, whose confidence

was gained by the authorities, and who gave most valuable help. Owing to difficulties with the hill tribes, the station at Papangi was removed to Kokoda, in most respects a better situation, and, it is hoped, a more or less healthy one, owing to its altitude of 1000 feet. It was proposed to transfer the other station from its unhealthy site at Tamata to some hills higher up the creek. The western division, in all respects a totally different world to the rest of the possession, has not yet attracted settlers, but an immense tract of country within it is probably well adapted to sugar-cultivation.

POLAR REGIONS.

Mr. A. H. Harrison's Expedition.—Under date March 1, Mr. Harrison writes from on board the steam-whaler *Jeannette*, at Herschel island, near the mouth of the Mackenzie, giving a brief account of his experiences down to the time of writing (cf. *Journal*, vol. 26, p. 561). Leaving Athabasca landing on July 22, in a boat specially built to transport his supplies, he reached the Arctic Red river (a western tributary of the lower Mackenzie) on October 4, but was then stopped by ice. On the way he took many observations for latitude and variation. During the winter he made a short route-survey, with perambulator, prismatic compass and sextant, of the winter trail from Red river to the Peel, down the latter from Fort McPherson to its mouth, and up the Mackenzie to the Red river. Observations for latitude and variation were also made at various points. During the winter, which was a very early one, with exceptionally deep snow, temperatures of 68° below zero Fahr. occurred. In order to avoid the risk of losing a year, Mr. Harrison left his goods behind, and went on to Herschel island in February, finding Lieut. Hansen and the members of the *Gjøa* expedition, except the leader, who had gone to Eagle city. He met with every kindness from them, as also from the captains of the whalers which had been caught by the early winter. As to his further movements, he feared it would be impossible to go north upon the ice, which round Herschel island is only floe-ice, constantly shifting with the wind. Nor was it possible to get natives to go north, in which direction, however, he is confident that land exists. From the whaling captains he gathered much information as to the movement of the ice, which seems to follow no definite law. Various ships have been carried away by the drift and not seen again, while of a number of buoys, put down by the captains for some years past, none have ever been heard of, and Mr. Harrison concludes that they have drifted on to land in the unknown area. The drift seems entirely governed by the winds.* Mr. Harrison hoped to make his way in April to Baillie island, and thence to Banks Land, where he proposes spending next winter.

Mr. Wellman's Air-ship Project.—Mr. Walter Wellman, who, in 1898, made an unsuccessful attempt to advance to the pole by the Franz Josef Land route, has formed the project of reaching that goal by means of an air-ship, and is now organizing an expedition, financed by Mr. Victor Lawson, principal owner of the *Chicago-Record Herald*. From an article on the expedition in the April number of the *National Geographic Magazine* we obtain the following information:—"No expense is being spared to secure the greatest possible chance of success. After consulting with the foremost experts in Paris, Mr. Wellman gave the contract for the air-ship to M. Louis Godard, whose experience as a constructor of such vessels is unique. It is to be of a size sufficient to enable it to lift, not only the balloon, but the car of steel, three motors with an aggregate of eighty

* It is usually considered that a general drift to the east sets along the north coast of Alaska (see Harris, in *Nat. Geog. Mag.*, 1904, pp. 255–261).

horse-power, two screws, a steel boat, motor sledges, five men, with food for seventy-five days, all necessary tools and appliances, and 5500 lbs. of gasoline. The gas-bag is made of the most carefully selected fabric, consisting, in the central zone of greatest pressure, of three layers of materials (two of cotton and one of silk), with three coats of rubber, the coefficient of safety throughout being calculated as over five to one. The outer surface is quite smooth, with no netting to hold moisture, snow, or frost, additional power of resistance being supplied by double bands of fabric cemented over the seams internally. The steel car is 52½ feet long, the central section being provided with walls and roof of water- and fire-proof fabric, the roof being 78½ inches above the floor. The motors should give, apart from the influence of winds, a speed of 17 geographical miles an hour, and Mr. Wellman reckons, from a careful study of the winds of the Arctic, that this should enable him to cope with over four-fifths of all that are likely to be encountered in July and August. When opposed by stronger winds, it is proposed to drift with them, the loss of ground being in part neutralized with the help of a dragging anchor, so that, as *all* the value of favourable winds will be utilized, more help than hindrance may be anticipated from the effect of winds as a whole. The expedition has the support of the National Geographic Society, and will be accompanied, as scientific representative of that body, by Major H. B. Hersey. The steamer *Frithjof*, already used more than once in connection with polar exploration, has been chartered for the seasons of 1906 and 1907, and will, it is hoped, sail from Tromsoe for Spitsbergen about June 20, headquarters being established at Low island, in lat. 80° 20′. Should all seem favourable, an attempt to reach the pole will be made this year, otherwise it will be postponed till 1907. The length of the whole trip by the air-ship is reckoned at ten days, but it is thought that it can be kept in the air as long as twenty, or possibly twenty-five, days. Mr. Wellman hopes to keep up communication with the outside world by means of wireless telegraphy, stations being established at the headquarters in Spitsbergen, and at Hammerfest, in Norway. We understand Mr. Wellman will take with him 2000 fathoms of sounding wire in the hope of getting soundings at one or two points.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Physical History of the Earth.—In the February number of the *Geological Magazine*, Mr. T. Mellard Reade points out the modifications which the discovery of radio-active materials may necessitate in our ideas respecting the past history of the Earth. Thus, as the rate of cooling of the latter must be slower than has been supposed in proportion to the quantity of heat generated by the radio-active matter present, the radial shrinkage will also be reduced, and the mountain-making activities on the contraction hypothesis rendered less efficient. Those who, like himself, have held in the past that the gradual dissipation of the initial heat of the Earth, considered simply as a cooling body, is insufficient to provide the radial contraction necessary to explain existing phenomena, will thus find new support for their contention, for if any of the lost heat is renewed, the insufficiency is proportionately intensified.

The Possible Thickness of an Ice-cap.—This subject is briefly discussed by Prof. E. H. L. Schwarz, in the light of recent research, in the March number of the *Geological Magazine* (Decade 5, vol. 3, No. 3). The writer points out that the view of the physicists that no column of ice could exist on the Earth's surface of a greater height than 1400 to 1600 feet is borne out by actual observations, especially those of Captain Scott in the Antarctic. In no case where there has been direct measurement has the ice been found to exist in sheets surpassing the 1600-feet limit, while the ratio between the portions of an iceberg below and above

water has been shown to be frequently much below the theoretic amount. It is only if the surface of the ground on which the ice-cap rests is below the temperature of the melting-point of ice that a thickness of over 1600 feet is possible, and, in view of the protection against radiation from the Earth afforded by an ice-cap, it is unlikely that this condition can be fulfilled. Drygalski's observations in Greenland have shown the rapid and regular rise in temperature which occurs in an ice-sheet from above downwards, the heating effect of pressure being a contributory cause. Mr. Schwarz holds that at a time of maximum glaciation (which is one of less intense cold), the running water beneath the ice will have had a powerful effect in deepening valleys, so that it is not safe to conclude, as is sometimes done, that ice once filled such valleys from their present bottoms to the highest levels at which ice-scorings are traceable on their sides.

GENERAL.

Prof. Penck's Successor.—Edward Brückner, Professor of Geography in Halle University, has been called to the chair of physical geography in Vienna University, in succession to Prof. Penck. Son of Alexander Brückner, Professor of History in Dorpat University, Edward Brückner was born in Jena, July 29, 1862. Only a few years younger than Penck, he is distinguished as his oldest disciple. As shown by his first important work, 'Die Vergletscherung des Salzachgebietes' (1886), and the work 'Die Alpen im Eiszeitalter' (1901-03), published in joint authorship with Penck, he has continued his faithful co-worker in the field of glacial research. He made himself a name by his 'Klimaschwankungen seit 1700,' published in 1890. In this, as in his hydrological works, he approved himself a scientific investigator of independent power. More widely known are his works, written with great perspicuity, 'Die feste Erdrind und ihre Formen' (1897) and 'Die Schweizerische Landschaft einst und jetzt' (1900). The first professional chair he held was in the Confederate University in Berne. In 1904 he succeeded Prof. Alfred Kirchhoff in Halle.

The Monaco Oceanographic Institute and Museum.—It is announced that the Prince of Monaco has decided to transfer to Paris the Oceanographic Institute founded by him at Monaco, and has set apart the munificent sum of £160,000 for its maintenance, besides endowing it with the museum established by him, and all the scientific appliances connected with it. The management of the institute, which will be placed on ground acquired, with the Prince's aid, by the University of Paris, will be vested in an international committee of specialists.

OBITUARY.

General Sir H. E. L. Thuillier, Kt., C.S.I., F.R.S.

On May 6 there passed away peacefully, at the ripe old age of ninety-three, Sir Henry Edward Landor Thuillier, Kt., C.S.I., F.R.S., the oldest survivor of the Hon. East India Company's Artillery, and one of the best known of the long line of scientific gentlemen who, as surveyors-general of India, have directed the progress and shaped the ends of map-making in that country until there is little left to discuss but the revision of out-of-date surveys and the exploration of trans-frontier regions. For thirty-one years (from 1847 to 1878) he held that responsible post ere he retired to become a useful member of the Royal Geographical Society's Council, and a friendly adviser to all who meditated geographical enterprise. To cast back to a date ten years before the Mutiny, and to describe

the position of the Indian surveys or of Asiatic geography at that time, would be an interesting analysis of scientific progress, but it would be a lengthy one. Half of India was then unknown. The plains of the Punjab (not fully wrested from the hands of the Sikhs) were as fair a blank in our maps as the basin of the Godavari or the forests of Southern India. Colonel Thuillier saw the great network of geodetic triangulation grow and spread over the length and breadth of the peninsula until it formed a well-ordered system of earth-measurement which was certainly the most exact in its day that existed in the world. Under his guiding hand men such as Walker, Basevi, Montgomerie, Tanner, Woodthorpe, and Harman (who with many others have passed from the scene of their labours before him) made their names famous as scientists and explorers, carrying their lives in their hands and their instruments and observations to the farthest peaks of the mountain border-land. Half a century of progressive Indian history is bound up with the life-work of such a man as Sir Henry Thuillier; and of all half-centuries that have ever been since India first marked its beginnings as a part of the British Empire, it is surely the most stirring and the fullest of civilized progress. Few figures were better known in Calcutta and Simla than his, and no man was better respected or more loved by his many friends. Genial and kindly, helpful and hospitable, he was typical of a phase of Anglo-Indian society which is rapidly disappearing. Times have changed; and he fitted to his times with the traditional sympathy and good fellowship which are only associated with intercourse between pilgrims in a foreign land when that land is new and strange. Sir Henry Thuillier belonged to an administrative phase that is past, and he was one of its worthiest and best representatives. His name will last in the social and scientific annals of India's growth when that of many a more magnificent administrator will be dead and forgotten.

T. H. H.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905-1906.

Eleventh Meeting, April 9, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., F.R.S., President, in the Chair.

PRESENTATION OF THE AMERICAN GEOGRAPHICAL SOCIETY'S MEDAL TO CAPTAIN R. F. SCOTT, R.N.

The PRESIDENT: The first business on the agenda paper to-night is the presentation by His Excellency the American Ambassador of the Gold Medal of the American Geographical Society to Captain Scott, R.N., commander of the National Antarctic Expedition. For several reasons this ceremony has an especial interest to the Royal Geographical Society, which has been so intimately connected with the enterprise which Captain Scott commanded. In the first place, as geographers, we recognize that the American Geographical Society is exceptionally qualified to gauge and appreciate the splendid qualities, moral, mental, physical, which enabled Captain Scott to carry his arduous enterprise to so successful a conclusion. And I say the American Society is especially qualified, because for the last sixty years or more the United States have taken a leading part in polar exploration. In the Antarctic Regions, which Captain Scott has come back from, their interests arose from having a preponderance of whalers in the southern seas, and there is one American name, that of Commander Wilkes, which stands out prominently in the same plane as that of his famous British contemporary, Sir James Ross. In the Arctic Regions the name of their

explorers is legion. As I must be very short in my introductory remarks, I can only pick out a few of the more celebrated names. As you may remember, the United States first engaged in Arctic work out of sympathy with the Franklin Expedition, which had been lost. It was a cause of pure philanthropy; they have carried it on since as a cause of idealism. There were the Grinnell expeditions, which lasted from 1850 to 1855, associated with the name of Dr. Kane. There was Dr. Hayes' expedition, which also went up Smith's sound. Then came Captain Hall, who, during ten years, led several successful expeditions. Then there was Lieut., now General, Greely; he is still alive. Perhaps the most famous of American Arctic explorers is Commander Peary. He is at the present moment engaged in an attempt to reach the north pole, in which we all trust he will succeed. I think I have justified the statement that an American Geographical Society is especially qualified to understand the value of Captain Scott's work. But we have a second ground of satisfaction to-night of an entirely different order. In our Society, besides being geographers we are also Englishmen, or perhaps it would be safer for me, in view of certain faces that I see here, to say Britons; and, as such, we value every expression of sympathy and understanding that comes to us from across the Atlantic. I think you would not wish me to sit down without a brief reference to a third and very strong ground of satisfaction in the ceremony to-night—I refer to the compliment implied in the channel through which this medal is about to reach Captain Scott. His Excellency the American Ambassador is the latest but not the least of that remarkable series of men, eminent in culture, in intellect, in ability, whom the wise policy of the United States has sent to the Court of St. James as ambassadors. Long may that high standard be maintained! And we cannot doubt that Captain Scott will appreciate this medal of the American Geographical Society all the more highly because it reaches him through the hands of Mr. Whitelaw Reid.

H. E. the Hon. WHITELAW REID (American Ambassador): Under the authority of my Government, and at the request of the American Geographical Society, I am here to-night to bring an expression of the high esteem in which the recent Antarctic work done by one of your young naval officers is held in the United States. Our people have never been unobservant or unappreciative of your great achievements in polar research. The very first Arctic exploring expedition ever sent out, I believe, was sent from these shores. It is interesting to remember to-night, as you have already reminded us, that three hundred years later the first Arctic exploring expedition sent out from the United States—the first, at least, of any importance—was organized by a merchant prince of New York to join in the general search then in progress for an English expedition which had not been heard from, and which never returned—that led by the lamented Sir John Franklin. It is interesting, too, to recall that when that long search of thirty years and more was ended, and the tragic fate of that expedition was finally ascertained, it was to a young American naval officer, Lieut. Schwatka, who was born in the same little Illinois town identified with General Grant—it was to that young naval officer, Lieut. Schwatka, that the frozen north gave up its long-kept secret. If I venture, following the precedent you have been good enough to set me—if I venture to mention the names of some other Americans not altogether unknown in polar exploration, names such as Kane, Wilkes, Hayes, Hall, Greely, Peary—if I mention these names, it is only for a reason which you have also already suggested: they show that those who have awarded the distinction which I have the honour to bring here to-night to the most recent of your explorers were by no means inexperienced or incompetent judges. The American Geographical Society and the American people have noted with interest and with admiration the work done by

your recent National Expedition, which spent two years and a half inside the Antarctic circle, which went within 7° and some minutes of the south pole, which was so skilfully and prudently led that during all those years of exposure and hardship it only lost two men, and which came back with larger additions to our knowledge of that least-known portion of the globe than had ever been brought before by any expedition from any country. Those whom I represent would not be the young and daring people they are if they did not find especial pleasure in the fact that this expedition was led by a man who had barely attained thirty years of age when he was assigned to the command, and that the majority of the force he conducted to such brilliant success was likewise composed of young men. Those I represent here would not be the Americans they are if they did not likewise take an especial pleasure in the fact that this work by these brave young men on this side of the water under these difficulties was done by Englishmen. The pleasure which they would have felt if they had done it themselves is the only pleasure they could feel greater than they experience now in seeing that you have done it. The official letter which I hold in my hand advises me that the American Geographical Society, at its last annual meeting, voted unanimously its highest award for scientific work, the Cullum Geographical Medal, to Captain Robert F. Scott, R.N., for the voyage of the ship *Discovery*, and for his sledge journey to lat. 82° 17′ S., 1901–4. In their name, Captain Scott, I now have the honour to present to you this Gold Medal, suitably inscribed, as an authoritative and most cordial American recognition of your high services to science.

Mr. Whitelaw Reid then presented the medal.

Captain Scott: I find it most difficult to express my appreciation of the extraordinary honour which is done me to-night by the American Geographical Society, or to express my appreciation of the manner in which that honour is enhanced by the fact that His Excellency, the representative of that great country, should have given this medal into my hands. In fact, I may say that with the awards and honours that have come from America my cup is brimming over, because this is the second time an American Geographical Society has awarded me a medal, and it is the second time it has been presented by the representative of the nation. I feel we must all consider the generous spirit in which it is given, and feel the greatness of the tribute which has been paid to a British explorer. But I, for myself, must also feel that the reward far exceeds the merit of the service. I think, perhaps, my first thought to-night is that this occasion provides the most excellent answer to a class of individual who bothers me greatly. It is the class of man who approaches me, and I am sorry to say he is very common; and he asks, After all, what was the good of it all, what was the use of it? Well, such a person as that, having a material mind, must have a material answer, and here it seems I am provided with the answer, because I can say now, "I have received two gold medals from America." Up to the present I have tried him with other methods. I have said to him, "The interest has been great to a number of English scientific men and English geographers." But I am sorry to say, I am sorry to speak it in this company, that he still remains doubtful as to the value of the service, because he regards us rather, I am afraid, as amiable but misguided enthusiasts. But, however, in future I shall be able to throw the United States at his head. I should commence, I think, perhaps by quoting some words of Emerson, which may or may not be remembered, and possibly I may not remember them correctly myself. But Emerson, speaking of Antarctic expeditions, wrote, "It is to the interests of all that these expeditions should take place, and a state or an individual who studies true economy will forget its frugality in behalf of claims

such as these." I do not know that I am word-perfect, but I know that that is the gist of his statement. It is a good thing to start with a statement such as that, but though I have been rather anticipated, I think I should go on to quote those deeds of American explorers, those names which are ever illustrious in polar exploration—of Kane, of De Long, of Hall, and last, but not least, of that great explorer, Peary, who is now absent, and whom we all wish success on his present mission. But, sir, I think such an occasion as this must supply to us something more than an answer to this material and ignorant person who is so largely in the majority of not knowing the uses of polar exploration. It supplies to us, I hope, some thought that polar exploration in a way helps those ties which join nations together apart from all political rivalry. Science, in working for the common end, brings the scientific men of all nations and of all times together in the pursuit of natural knowledge; and it seems to me that polar exploration, as a field from which political consideration must be altogether banished, plays no small part in forging that bond which we must all wish to see strengthened.

I have spoken so far of the past, and there seems to me some words left to be said of the future of polar exploration. I am sorry to say that my lines are cast in such places that in all probability I shall not myself return to those regions --regions where there is a fascination which is hardly to be explained to those who have not visited them. Sometimes now, caught up in the whirl of this modern life, and with my activities chained to new interests, my thoughts go back to those past times, and I see again those fields of snow sparkling in the sun; I see the pack-ice and the bergs dotted over the blue sea, and I see those mountains, those glorious southern mountains, rearing their heads in desolate grandeur; and again I hear the movements of the pack, those small mysterious movements with just the hush sound that comes over the water, and I hear also the swish of the sledge as it came across the snow—I see and hear all these things, and though I cannot explain to you, they will always drag my thoughts back to those good times when these things were before me. Although I may not myself as perhaps circumstances prove too strong for one—go back to those regions, yet there is always this thought in an explorer's mind, he must hope for those who come after to do better, and so he must always take the intensest interest in their doings. Consequently, I have almost a plea to make for those who are going forth in the same path. Just at present I am sorry to say Antarctic exploration does not meet with much encouragement; but I would like to remind you that a young officer of mine, Lieut. Michael Barne, wishes to go. He has the sympathy of this Society, but little more. However, I hope that in time and by persistence he will not only get more practical sympathy from the Society, but practical sympathy from a larger public. Indeed, this question of the Antarctic I feel is going to be re-opened again, for abroad, in Belgium, an idea of an International Conference has been raised, and that, I hope, will produce good results, though we may not altogether agree with the methods. But I may even have further news to tell you, and news for his Excellency from across the Atlantic; it may be news—I hope it is. At any rate, a correspondent from the other side of the water sends me these cryptic words. He says, "The man with his ear to the ground over here can hear rumours." That means, I am sure, that an American exploring expedition is going forth to the Antarctic Regions, and I have not a doubt that that expedition will attempt to reach beyond that point which we were fortunate enough to reach ourselves, and I have not the least doubt that they will succeed in doing so, and I need not tell you that I heartily wish them success. I can see again—to me the interest of that scene can perhaps be imagined—there in the distance those

mountains which nobody had ever seen before, and which represent the most southerly scene that any mortal man had ever seen. Dim and uncertain as it is, you can imagine how thrillingly interesting any light thrown on that mysterious region must be to me. I heartily wish that the commander of that American expedition may bring information on that subject; and then, sir, I think we shall all look forward to the time when you will present him with a Gold Medal of the Royal Geographical Society, and he will receive it with the same sense of honour with which I have received this medal to-night.

Twelfth Meeting, May 7, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., F.R.S., President, in the Chair.

ELECTIONS.—*Lieut. E. C. Baker, R.E.; Ralph James Dolby Belham; Captain Chas. Vicars Brocklehurst Boyle (York and Lancaster Regt.); Senhor Dr. Alfredo de Carvalho; Robert Edleston, M.A.; Joshua Goodland; H. R. Hall; Lieut.-Colonel Dugald McTavish Lumsden, C.B.; Edwin S. Oak-Rhind; Fras. Robinson Reeves; Hon. E. J. Stanley; H. F. Ward.*

The paper read was:—

"From the Victoria Nyanza to Kilimanjaro." By Captain G. E. Smith, R.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

France—Brittany. **Miltoun.**

Rambles in Brittany. By Francis Miltoun. With many illustrations by Blanche McManus. London: Duckworth & Co., 1905. Size 8 × 5½, pp. xiv. and 376. *Map. Price* 6*s. net. Presented by the Publishers.*

See below, Normandy.

France—Normandy. **Miltoun.**

Rambles in Normandy. By Francis Miltoun. With many illustrations by Blanche

McManus. London: Duckworth & Co., 1905. Size 8 × 5½, pp. xii. and 448. *Maps. Price 6s. net. Presented by the Publishers.*

This and the similar work on Brittany contain a considerable amount of practical information which may be useful to the tourist, besides giving the stay-at-home reader a pleasant account of people and places in North-West France.

Holland.

Détermination de la Latitude et d'un Azimut aux stations Oirschot, Utrecht, Sambeek, Wolberg, Harikerberg, Sleen, Schoorl, Zierikzee, Terschelling (phare Brandaris), Ameland, Leeuwarden, Urk et Groningue. (Publication de la Commission géodésique néerlandaise.) Delft: J. Waltman, jr., 1904. Size 11½ × 9, pp. lvi and 286. *Presented by the Commission géodésique néerlandaise.*

Iceland. *G.Z.* **11** (1905): 629-637. **Mogk.**

Island und Seine Bewohner. Von E. Mogk.

Iceland. *Petermanns M., Ergänzungsheft* No. 152 (1905): pp. 162. **Thoroddsen.**

Island. Grundriss der Geographie und Geologie. Von Prof. Dr. T. Thoroddsen. I. *With Maps.* [To be reviewed.]

Italy—Emigration. *Questions Dipl.* **21** (1906): 36-45, 96-110. **Gonnard.**

L'Émigration italienne et les colonies sans drapeau Par René Gonnard.

Italy—Rome. **Reynolds-Ball.**

Rome. A Practical Guide to Rome and its Environs. By Eustace Reynolds-Ball. London: A. & C. Black, 1906. Size 7 × 4½. pp. viii. and 256 *Plans and Illustrations. Price 2s. 6d. Presented by the Publishers.*

Well suited to the tourist who desires to see the best of the antiquities of Rome in a limited time.

Mediterranean—Cyprus. **Richards**

The Cyprus Civil List 1905. Compiled by T. H. Hatton Richards. Nicosi, 1905. Size 10 × 6½, pp. 152 and lxvi. *Map. Presented by the Chief Secretary to Government, Cyprus.*

Russia.

Memoirs of the Military Topographical Department of the General Staff. Vols **59** and **60**. [In Russian.] St. Petersburg, 1902-3. Size 13½ × 10, pp. (vol. **59**) 100 and 252; (vol. **60**) 138 and 214. *Maps*

Russia—Cartography. **Shokalsky.**
Rep. Eighth Internat. G Congress, 1904 (1905): 574-575.

La carte de la Russie d'Europe, en 16 feuilles, à l'échelle de 1 : 2,000,000. Par Col. J. de Schokalsky.

Scandinavia. *G.Z.* **11** (1905): 657-671. **Kjellén.**

Geopolitische Betrachtungen über Skandinavien Von R. Kjellén.

Servia. *Ann G* **14** (1905): 424-432. **Erdeljanović.**

Les études de géographie humaine en pays serbe. Par J. Erdeljanović.

Spain. *Tour du Monde* **11** (1905): 577-624. **Dieulafoy.**

De Tolède à Grenade. Par Mme J. Dieulafoy. *With Illustrations.*

Spain—Numantia. **Schulten.**

Numantia: Eine topographisch-historische Untersuchung. Von A. Schulten. (Abh. K. Ges. W. Göttingen. Phil.-Hist. Klasse N F., Bd. viii Nro. 4.) Berlin: Weidmannsche Buchhandlung, 1905. Size 11 × 9, pp. x. and 112. *Map and Plans. Price 10s.*

Switzerland. *Naturw. Wochenschrift* **4** (1905): 817-825. **Brückner.**

Höhengrenzen in der Schweiz. Von Prof. Dr. E. Brückner.

Turkey—Macedonia. **Götz.**
Jahresb. Frankfurter V.G. u. Statistik **68** and **69** (1903-5): 131-135.

Von der Hauptstadt Nordmazedoniens auf den Schardagh. Von Prof. Dr. W. Götz.

Turkey—Macedonia. **Brailsford.**

Macedonia, its Races, and their Future. By H. N. Brailsford. London: Methuen & Co., [1906]. Size 9 × 6, pp. xx. and 340. *Maps and Illustrations. Price 12s. 6d. net. Presented by the Publishers.* [To be reviewed.]

United Kingdom—Ireland. **Anderson.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 613-615.
The Flora of Connaught as evidence of the former connection with an Atlantic Continent. By Prof. R. J. Anderson.

United Kingdom—Rainfall. **Marriott.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 340-342.
Rainfall with altitude in England and Wales. By W. Marriott.

United Kingdom—Scotland. *Geol. Mag* 3 (1906): 22-25. **Jamieson**
On the Raised Beaches of the Geological Survey of Scotland By T. F. Jamieson.

United Kingdom—Scotland. **Morris.**
The Forth Valley in Pre-glacial Times. By D. B. Morris. Stirling: J. Hogg & Co., 1905. Size 7½ × 5, pp. 24.

ASIA.

India—Earthquake. *Records Geol. Surv. India* 32 (1905): 258-294. **Middlemiss**
Preliminary Account of the Kangra Earthquake of April 4, 1905. By C. S Middlemiss. *With Maps.*

India—Survey. **Hobday.**
General Report on the Operations of the Survey of India, 1903-04 Prepared under the direction of Colonel J. R. Hobday. Calcutta, 1905. Size 13½ × 8½, pp. iv., 62, and xlii. *Maps and Illustrations. Presented by the Survey of India.*

Indian Ocean *B.S.G Com Bordeaux* 28 (1905): 307-317, 321-333. **Lorin.**
Les voies d'accès de l'Océan Indien. Par H. Lorin.

Indian Ocean—Seychelles. *Nature* 73 (1906): 294-296. **Gardiner.**
The Percy Sladen Expedition in H.M.S. *Sealark* to the Indian Ocean. The Seychelles Archipelago. By J. Stanley Gardiner. *With Charts and Illustration.*
Noticed in the April number (p. 405).

Japan. **Chamberlain.**
Things Japanese, being notes on various subjects connected with Japan, for the use of travellers and others. By Basil Hall Chamberlain. Fifth Edition, revised. London: John Murray, 1905. Size 9 × 6, pp. vi. and 552. *Map. Price* 10*s.* 6*d. net. Presented by the Publisher.*

This well-known book remains essentially the same in the new edition, though numberless minor alterations have been made.

Korea. **Genthe.**
Korea, Reiseschilderungen von Dr. Siegfried Genthe. Herausgegeben von Dr. Georg Wegener. Zweite Auflage. Berlin: Allgemeiner Verein für Deutsche Literatur, 1905. Size 9 × 6, pp. l. and 344. *Portrait. Price 6m. Presented by the Publishers.*

The author (who was murdered in 1903 in Morocco, where he represented the *Cologne Gazette*) was a journalist of an exceptional kind, having had the advantage of a sound university education. His studies of the countries he visited give an excellent insight into their geographical and social conditions, and the collected series of his travels, of which the above forms the first volume, should be well worthy the attention of serious students. Dr. Genthe had for some years been known to geographers as the author of a study on the Persian gulf, produced as a dissertation for the degree of Doctor at Marburg.

Malay Archipelago—Java. **Rouffaer.**
Bijd. Taal-, Land- en Volk. Ned.-Indie 5 (1906): 178-179.
De Chineesche naam Ts'e-ts'un voor Grĕsik. Door G. P. Rouffaer

Gresik, on the north coast of Java, was the first place in the island visited by the Portuguese at the beginning of the sixteenth century.

Malay Peninsula. *Petermanns M.* 51 (1905): 249-254, 271-277. **Grubauer.**
Negritos. Ein Besuch bei den Ureinwohnern Innermalakkas. Von A. Grubauer.

Persia. **Gleadowe-Newcomen.**
Report on the British Indian Commercial Mission to South-Eastern Persia during 1904-1905. By A. H. Gleadowe-Newcomen. Calcutta, 1906. Size 13½ × 8½, pp. 2 and 156. *Map. Presented by the Author.*

Persia. *Rev. G.* **55** (1905): 330-339. **Regelsperger.**
La Délégation française en Perse (Mission de Morgan). Par G. Regelsperger. *With Map and Illustrations.*

M. de Morgan's present mission dates from 1897, and has resulted in additions to geographical as well as archæological knowledge.

Persia—Luristan. *Petermanns M.* **51** (1905): 265–271. **Strauss.**
Eine Reise an der Nordgrenze Luristans. Von T. Strauss. *With Map.*

Philippine Islands. **Saleeby.**
Studies in Moro History, Law, and Religion. By Najeeb M. Saleeby. (Dep. of the Interior, Ethnological Survey Publs. vol. **4**, pt. i.) Manila, 1905. Size 10½ × 7½, pp. 108. *Plates. Presented by the Ethnological Survey for the Philippine Islands.*

Philippine Islands. **Pérez.**
Relaciones Agustinianas de las razas del norte de Luzon. Coleccionadas por el Rdo. P. Fray Angel Pérez. (Department of the Interior. Ethnological Survey Publications. Vol. **3**, Spanish Edition.) Manila, 1904. Size 10½ × 7½, pp. 412. *Maps and Illustrations.*

The documents here printed were written, mostly in the eighteenth century, by missionaries working among the native tribes of the north of Luzon. Some will also be issued in English in the publications of the same survey.

Philippines—Ethnology. **Gannett.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 670-675.
The peoples of the Philippines. By Henry Gannett. *With Map.*

Russia—Siberia. *Mem. A. Imp Sc. St. Pétersbourg* **16**, No. 1 (1904): pp. 126. **Matsokin.**
Mixed races of Trans-Baikalia. Anthropological Study by Dr. P. G. Matsokin. [In Russian.]

Russia—Siberia. ———
Scientific Results of the Expedition sent out by the Imperial Academy of Science for the excavation of the Mammoth found near the River Berezovka in 1901. Vol. 1. [In Russian.] St. Petersburg, 1903. Size 13½ × 10, pp. 156. *Plates. Presented by the Academy of Sciences of St. Petersburg.*

Siam and Malay Peninsula. *J.R. Asiatic S.* (1906): 107–119. **Blagden.**
Siam and the Malay Peninsula. By C. O. Blagden.

Turkey—Palestine. *Palestine Explor. Fund, Quart. Statement* (1906): 50–54. **Watson.**
The Acra. By Sir C. Watson, K.C.M.G. *With Plans and Sections.*

Discusses the position of the ancient fortress of Jerusalem.

Turkey—Palestine—Ancient Map. **Jacoby.**
Das geographische Mosaik von Madaba. Die älteste Karte des Heiligen Landes. Ein Beitrag zu ihrer Erklärung von A. Jacoby. (Studien über Christliche Denkmäler, herausgegeben von J. Ficker. 3 Heft.) Leipzig: T. Weicher, 1905. Size 9½ × 6½, pp. x. and 110. *Facsimile. Price 4s.*

Some account of the map was given in vol. **17**, p. 516.

Turkey—Syria. **Euting.**
Jahresb. Frankfurter V.G. u. Statistik **68** and **69** (1903–5): 162–164.
Die Schlossruinen von Meschatta. Von Prof. Dr. J. Euting.

AFRICA.

East Africa—Swahili. **Velten.**
Praktische Suaheli-Grammatik nebst einem Deutsch-Suaheli Wörterverzeichnis. Von Prof. Dr. C. Velten. Zweite Auflage. Berlin: W. Baensch, 1905. Size 7 × 5½, pp. x. and 388. *Price 4m. Presented by the Publisher.*

This is, perhaps, the best text-book of Swahili that has yet appeared, and its value is vouched for by the fact that a second edition has been called for within a year from its first appearance.

French Sahara—Economics. **Gautier.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 892-900.
Le valeur commerciale et industrielle du Sahara français. Par E. F. Gautier.

French Sudan. *Rev. Française* **30** (1905): 595–605. **Barré.**
Soudan Français. Le ravitaillement par le bas Niger. Mission Fourneau. Par P Barré. *With Map.*

Gambia. **Archer.**

The Gambia Colony and Protectorate. An Official Handbook. By Francis Bisset Archer. London: St. Bride's Press, Ltd., [1906]. Size $9\frac{1}{2} \times 6$, pp. xviii. and 364. *Maps, Plans, and Illustrations. Price* 10*s. net. Presented by the Publishers.*

The first ninety-five pages supply a useful history of the Gambia region and its development from the earliest times, the rest of the book forming a handbook of practical and statistical information.

German East Africa. *M. Deutsch. Schutzgeb.* **18** (1905): 359. **Uhlig.**

Erdmagnetische Deklination in Daressalam, mitgeteilt von Prof. Dr. C. Uhlig.

German South-West Africa. *Naturw. Wochenschrift* **5** (1906): 37–40. **Gessert.**

Die Inselberge im Namalande. Von F. Gessert.

German South-West Africa. **Rehbock.**

Deutsch. Kolonialzeitung **23** (1906): 4–5, 12, 23–25.

Die Aufstauung des Grundwassers in den Flussbetten Deutsch-Südwestafrikas. Von T. Rehbock.

German South-West Africa. *Deutsch. Rundschau G.* **28** (1905): 62–66. **Zürn.**

Einiges zur Ethnographie der Hereros. Von R. Zürn. *With Illustrations.*

Libyan Desert. *M.G. Ges München* **1** (1905): 494–496. **Reichenbach.**

Geographische Beobachtungen in der libyschen Wüste. Von Dr E Freiherr Stromer von Reichenbach.

Madagascar. *Tour du Monde* **11** (1905): 541–564. **Du Picq.**

Une peuplade Malgache; Les Tanala de l'Ikongo. Par M. le Lieutenant A. du Picq. *With Map and Illustrations.*

Madagascar—Bibliography. **Grandidier.**

G Grandidier. Bibliographie de Madagascar. Préface de M. J. Charles-Roux. Première partie. Paris. Comité de Madagascar, 1905. Size $10 \times 6\frac{1}{2}$, pp. viii. and 434.

This part consists of works arranged alphabetically under authors' names, while the second volume is to include anonymous, official, and other publications of a special class. The compilation has evidently been carried out with great care, and the work forms a complete guide to the literature of Madagascar.

Mauritius—Climate. **Claxton**

Rep. Eighth Internat. G. Congress, 1904 (1905): 352–379.

Climate of Pamplemousses in the Island of Mauritius. By T. F. Claxton.

Natal—Climatology. **Evelyn.**

Rep. Eighth Internat. G. Congress, 1904 (1905): 343–347.

Climatology of the Lowlands and Watershed Terraces of Natal. By F. W. d'Evelyn.

Nigeria. **[Lugard.]**

Northern Nigeria. Report for 1904. Colonial Reports, Annual No. 476, 1905. Size $9\frac{1}{2} \times 6$, pp. 148. *Price 8d.*

Nigeria. ———

Nigeria. Correspondence relating to Railway Construction in Nigeria. London: Wyman & Sons, 1905. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. viii. and 204. *Maps and Diagram. Price 3s. 6d.*

North-East Africa. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 680–689. **Smith.**

Africa between the River Juba and the Nile. By A. Donaldson Smith.

Sahara. *Ann. G.* **14** (1905): 459–461. **Gautier.**

Voyage de MM^rs^ Gautier et Chudeau à travers le Sahara. Par É. F. Gautier.

See the January number, p. 88, and May, pp. 504, 505.

Sahara. *La G., B.S.G. Paris* **12** (1905): 209–238. **Villatte and Trépied.**

Du Tidikelt vers Tombouctou (Ahenet, Adrar, Hoggar, et Tifedest). Par N. Villatte. *With Map and Illustrations.*

Remarques sur la carte dressée par M. Villatte à la suite de son exploration de 1904 dans le Sahara central Par C. Trépied.

Noticed in the January number, p. 87.

Sahara. *Rev G.* 55 (1905): 353-359. ——
Questions sahariennes. *With Map and Illustrations.*

On the recent consolidation of French influence south of Algeria. The map shows the limit between the French spheres of the north and south.

South Africa. *Deutsch. Kolonialblatt* 17 (1906): 38-43, 72-77. **Rohrbach.**
Bericht über eine Studienreise des Ansiedlungskommissars Dr. Rohrbach nach der Kapkolonie und den angrenzenden britischen Landesteilen.

The journey was for the study of the economic conditions.

South Africa. *Deutsch. Kolonialblatt* 16 (1905): 707-711. ——
Ueber eine Reise in das englische Ngami-See-Gebiet. *With Sketch-map.*

South Africa—Victoria Falls. *Geolog. Mag.* 2 (1905): 529-532. **Lamplugh.**
Notes on the Geological History of the Victoria Falls. By G. W. Lamplugh, F.R.S.

Mr. Lamplugh has confirmed Mr. Molyneux's views (*Journal*, vol. 25, p. 40).

South Africa—Zambesi. *Nineteenth Century* 58 (1905): 980-991. **Trevor-Battye.**
From Dawn to Dark on the High Zambesi. By A. Trevor-Battye

A general picture of the nature of the upper Zambezi without any precise specification of locality.

Togo. *M. Deutsch Schutzgeb.* 18 (1905): 305-315. **Koert.**
Ueber die Wasserverhältnisse im Südlichen Togo. Von Dr. Koert *Sketch-maps.*

Togo. *M. Deutsch. Schutzgeb* 18 (1905): 316-317. **Sprigade.**
Begleitworte zur Karte 5: Blatt E1, Misahöhe, der Karte von Togo, 1 : 200,000. Von P. Sprigade. *With Map.*

Transvaal. ——
Transvaal Mines Department. Annual Report of the Government Mining Engineer for the year 1905 Pretoria, 1905 Size 13½ × 8½, pp. 64, 6, 18, 8, 10, and 12. *Maps and Diagrams*

West Africa. *M Deutsch Schutzgeb.* 18 (1905): 348-351. **Marquardsen.**
Die Höhenmessungen von Oberleutnant Marquardsen bei Gelegenheit der Yola-Tschadsee-Grenzexpedition.

West Africa. *A travers le Monde* 12 (1906): 22-23. ——
Les Pêcheurs canariens du Banc d'Arguin.

NORTH AMERICA.

Canada—Nova Scotia. *P and T. Nova Scotian I. Sc.* 11 (1902 3): 18-88. **Woodman.**
Geology of the Moose River Gold District, Halifax County, Nova Scotia. By Prof. J. E Woodman, D.SC. *With Illustrations.*

Canada—Ontario. **Ells.**
Report on the Geology of a portion of Eastern Ontario (*to accompany Map-sheet No.* 119). By R W. Ells ('Ann. Rep. Geolog. Surv Canada,' vol. 14, pt. J.) Ottawa, 1904. Size 10 × 6½, pp. 90. *Map.*

Canada—Phenology. *P. and T. Nova Scotian I. Sc* 11 (1902-3): 144-157. **MacKay.**
Phenological Observations in Nova Scotia and Canada, 1902. By A H. MacKay, LL.D.

Canada—Prince Edward Island **Poole.**
P. and T. Nova Scotian I. Sc 11 (1902-3): 1-7.
Is there Coal under Prince Edward Island? By H. S Poole, D.SC.

Canada—Yukon. **McConnell.**
Recent Mineral Discoveries on Windy Arm, Tagish Lake, Yukon. By R. G. McConnell. Ottawa, 1905. Size 10 × 6½, pp. 12.

Mexico. *Mem. y Rev. S. Ci. "Antonio Alzate"* 21 (1904): 365 369 **Angermann.**
Observacionas geologicas en una ascencion al Citlaltepetl (Pico de Orizaba) Por el Dr. E. Angermann. *With Illustration.*

See *ante*, p. 632.

Mexico—Historical. *Rep Eighth Internat. G. Congress*, 1904 (1905): 945-951. **Chavers.**
Fundación de Mexico-Tenochtitlan. Par Alfredo Chavers.

North America—Biogeography. **Adams.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 623–637.
The Post-glacial Dispersal of the North American Biota. By C. C. Adams. *With Map.*

North America—St. Lawrence. **Coleman.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 480–486.
Glacial lakes and Pleistocene Changes in the St. Lawrence Valley. By Prof. A. P. Coleman.

United States *Rep. Eighth Internat. G. Congress*, 1904 (1905): 193–203. **Hobbs.**
Lineaments of the Atlantic Border Region. By W. H. Hobbs. *With Map.*

United States—Archæology. *Smithsonian Rep.* 1904 (1905): 583–605. **Hewett.**
A general view of the Archæology of the Pueblo region. By E. L. Hewett. *With Illustrations.*

United States—California **Mendenhall.**
Development of Underground Waters in the Eastern (Central, Western) Coastal Plain Region of Southern California. By Walter C. Mendenhall. (U.S. Geol. Surv., Water Supply and Irrigation Papers, Nos. 137–139.) Washington, 1905. Size 9¼ × 6, pp. (137) 140, (138) 162, (139) 106. *Maps and Illustrations. Presented by the United States Geological Survey.*

United States—Cascade Mountains. *Mazama* **2** (1905): 272–280. **Banks.**
Bibliography of the Cascade Mountains. By Mary Banks.

United States—Climatology **Henry.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 266–271.
A Climatological Dictionary for the United States. By Prof. A. J. Henry.

United States—Education. **Dryer.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 972–976.
Geography in the normal schools of the United States. By Prof. Charles Redway Dryer.

United States—Ethnology. **Stevenson.**
Twenty-third Ann. Rep. Bureau American Ethnology, 1901–2 (1904): pp. 634.
The Zuñi Indians, their Mythology, Esoteric Fraternities, and Ceremonies. By Matilda Coxe Stevenson. *With Illustrations.*

United States—Florida. **MacGonigle.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 767–771.
The Everglades of Florida. By Rev. J. N. MacGonigle.

United States—Glaciers. *Mazama* **2** (1905): 195–200 **Reid.**
The Glaciers of Mount Hood and Mount Adams. By H. F. Reid. *With Illustrations.*

United States—Hydrology. **Newell and Others.**
Report of Progress of Stream Measurements for the Calendar Year 1904. Prepared under the direction of F. H. Newell. 12 Parts. (U.S. Geol. Surv., Water-Supply and Irrigation Papers, Nos. 124–135.) Washington, 1905. Size 9 × 6. *Maps and Illustrations. Presented by the United States Geological Survey.*

United States—Irrigation. *Smithsonian Rep.* 1904 (1905): 383–388. **Lippincott.**
The Yuma Reclamation Project. By J. B. Lippincott. *With Map.*

United States—Louisiana **Du Caillaud.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 939–940.
Les limites au nord-ouest de la Louisiane cédée par la France aux États Unis en 1803. Par F. Romanet du Caillaud.

United States—Mississippi. **Morgan.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 952–955.
Morgan's journey down the Mississippi in 1767. By Colonel James M. Morgan.

United States—Montana. **Chaney**
Rep. Eighth Internat. G. Congress, 1904 (1905): 493–496.
Glacial Exploration in the Montana Rockies. By Prof. L. W. Chaney.

United States—Palæobotany. **Ward**
Status of the Mesozoic Floras of the United States. Second Paper by Lester F.

Ward, with the Collaboration of William M. Fontaine, Arthur Bibbins, and G. R. Wieland. 2 Parts. Part I.—Text; Part II.—Plates. (Monographs of the United States Geographical Survey, vol. 48) Washington, 1905. Size 12 × 9½, pp. 616. *Presented by the United States Geological Survey.*

United States—Survey. **Hodgkins and Putnam.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 586–598.
Geographic Work of the United States Coast and Geodetic Survey. By W. C. Hodgkins and G. R. Putnam.

United States—Washington. *Mazama* 2 (1905): 185–189. **Gannett.**
Lake Chelan and its Glacier. By H Gannett *With Illustrations*

CENTRAL AND SOUTH AMERICA.

Martinique. *B.S.G Italiana* 7 (1906): 26 42. **Sabatini.**
L'eruzione della Pelata e i suoi insegnamenti Nota del V Sabatini.

Panama Canal. *Smithsonian Rep*, 1904 (1905). 737 744 **Burr.**
The Present Aspects of the Panama Canal By W. H. Burr.
From the *Engineering Magazine*, New York.

Panama Canal. **Kraentzel.**
Le Canal de Panama Par Dr. F. Kraentzel (Travaux du Séminaire de Géographie de l'Université de Liége, Fasc. IV) Liége: D Cormaux, 1905. Size 9 × 6, pp. 58. *Map and Diagram.*

Panama Canal. *National G. Mag.* 16 (1905): 558–564. **Shonts.**
What has been accomplished by the United States toward building the Panama Canal. By T. P. Shonts.

Peru. *B. Cuerpo Ingen. Minas Perú*, No. 27 (1905): pp. 114. **Adams.**
Caudal, procedencia y distribución de aguas de la Provincia de Tumbes y los Departamentos de Piura y Lambayeque. Por J. I. Adams. *With Maps and Illustrations.*

Peru—Andes. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 497-500. **Pfordte.**
The Glaciers of Poto, Peru. By O. F. Pfordte.

Peru—Irrigation. *B Cuerpo Ingen. Minas Perú*, No. 28 (1905): pp. 48. **Sutton**
Estudio de un proyecto para irrigar el valle de Ica. Por C. W Sutton. *With Maps, Plan, and Diagram.*

MATHEMATICAL GEOGRAPHY.

Surveys—Marine. **Littlehales.**
Rep. Eighth Internat. G Congress, 1904 (1905): 576–579.
Marine Hydrographic Surveys of the Coasts of the World. By G. W. Littlehales. *With Map.*

Time. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 785–800. **Hayden.**
The chronometer and time service of the United States Naval Observatory and the present status of standard time. By Lieut. Comm E. E. Hayden.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geophysics. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 455-464. **Lallemand.**
Relations de la Figure du Globe avec la Distribution des Volcans et Tremblements de Terre. Par le prof. G. Lallemand. *With Map and Illustrations.*

Geophysics. *Geol Mag.* 3 (1906): 79-80. **Reade.**
Radium and the Radial Shrinkage of the Earth. By T. M. Reade.

Glaciers. *Rep. Eighth Internat G. Congress*, 1904 (1905): 487–491 **Reid**
The Reservoir Lag in Glacier Variations. By H. F. Reid.

Hydrology—Whirlpools. **Brunhes.**
Rep. Eighth Internat G. Congress, 1904 (1905): 328-339.
De la Prédominance des Tourbillons en sens inverse des aiguilles d'une montre dans les Cours d'eau de l'Europe Centrale et Occidentale. Par Jean Brunhes

Limnology. *Petermanns M.* **51** (1905): 219-233. **Halbfass.**
Die Thermik der Binnen-Seen und das Klima. Von Prof. Dr. W. Halbfass. *Also separate copy, presented by the Author.*

Meteorology. *B. Musée Océanograph. Monaco*, No. **53** (1905): pp. 6. **Hergesell.**
Sur une exploration de l'atmosphère libre au-dessus de l'océan Atlantique au nord des régions tropicales, en 1905. Par H. Hergesell.

Meteorology. **Marriott.**
Hints to Meteorological Observers. Prepared under the direction of the Council of the Royal Meteorological Society. By W. Marriott. 6th edit. London: E. Stanford, 1906. Size 10 × 6½, pp. 70. *Illustrations. Price* 1s. 6*d. Presented by the Author.*

Meteorology—Air-currents. *Monthly Weather Rev.* **33** (1905): 390-391 **Clayton.**
The lifting power of ascending currents of air. By H. H. Clayton.

Meteorology—Rain. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 393-396. **Mill.**
On the Unsymmetrical Distribution of Rainfall about the path of a Barometric Depression crossing the British Isles. By Dr. H. R. Mill. *With Maps.*

Meteorology—Snow. *Petermanns M.* **51** (1905): 237-239. **Crammer.**
Die Furchung der Winterschneedecke in den Gebirgstalern. Von Prof. H. Crammer.

Meteorology—Temperature *Abh. K. K. G. Ges. Wien* **6**, No. 3 (1905): pp. 30. **Kerner.**
Thermoisodromen. Versuch einer kartographischen Darstellung des jährlichen Ganges der Lufttemperatur. Von Dr. F. v. Kerner. *With Maps.*

Meteorology—Temperatures. *Met. Z.* **23** (1906): 1-6. **Woeikof.**
Verhältnis der Temperatur der untersten Luftschicht zu jener der oberen Schichten des Festen und Flüssigen. Von A. Woeikof.

Noticed in the Monthly Record for May (p. 509).

Meteorology—Upper Atmosphere. *Meteorologische Z.* (1905): 481-486. **Hergesell.**
Ballonaufstiege über dem freien Meere zur Erforschung der Temperatur und Feuchtigkeitsverhältnisse sowie der Luftströmungen bis zu sehr grossen Höhen der Atmosphare. Von H. Hergesell.

Oceanography. *B. Musée Océanograph. Monaco*, No. **54** (1905): pp. 12. **Allemandet.**
Analyses des échantillons d'eau de mer recueillis pendant la Campagne du yacht *Princesse-Alice* en 1905 (kun esperanta traduko). Par G. H. Allemandet.

Oceanography—Currents. **Witte.**
Rep. Eighth Internat G. Congress, 1904 (1905): 408-424.
Strömungen der Luft und des Wassers. Von Emil Witte. *With Diagram*

Oceanography—Exhibition. ———
Exposition Coloniale de Marseille en 1906. Exposition Internationale d'Océanographie des pêches maritimes et des produits de la mer. Paris. Size 9½ × 6½, pp. 24.

Oceanography—Fauna. **Ortmann.**
Rep. Eighth Internat. G Congress, 1904 (1905): 618-620.
Origin of the Deep-sea Fauna. By Dr. A. E Ortmann.

Oceanography—Nomenclature. *B.S.G. Italiana* 7 (1906): 10-14. **Roncagli.**
Terminologia e nomenclatura delle forme del rilievo sottomarino. Nota del comandante G. Roncagli.

Discussion of the scheme recently adopted by the International Committee, with suggested Italian equivalents of the terms.

Oceans. *G. Anzeiger* **6** (1905): 217-220. **Arldt.**
Die Grenzen der Ozeane. Von Dr. T. Arldt.

Phytogeography—Method **Drude.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 608-612.
Die Methode der pflanzengeographischen Kartographie, erläutert an der Flora von Sachsen. Von Prof. Dr. Oscar Drude.

Seismology *Naturw. Wochenschrift* **4** (1905): 801-810.
Die drei Katastrophen-Erdbeben des Jahres 1905. *With Maps and Illustrations.*

Speleology—Methods. **Martel.**
La photographie souterraine au magnésium. Par E. A. Martel. Size 9½ × 6½, pp. 411–424. *Illustrations. Presented by the Author.*

GENERAL.

Almanac. ———
An Almanac for the year 1906. Compiled at the offices of the Survey Department, Ministry of Finance. Cairo, 1905. Size 9½ × 6½, pp. 104.

Among other useful tables is one of standard times in the various continents.

Ballooning. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 348–351. **Boulenger.**
Aerostation associated with the Study of Geography. By E. V. Boulenger.

Congress. ———
Report of the Eighth International Geographic Congress, held in the United States, 1904. Edited by the Committee on Printing. Washington: Government Printing Office, 1905. Size 9½ × 6, pp. 1064. *Maps and Illustrations. Presented by the Congress.*

Educational. *G.Z.* 11 (1905): 699–701. **Fischer.**
Die Forderungen der Geographen an die höhere Schule und die biologische Bewegung. Von H. Fischer.

Geography. *G.Z.* 11 (1905): 545–564, 615–629, 671–686. **Hettner.**
Das Wesen und die Methoden der Geographie. Von A. Hettner.

Geography. **Kraentzel.**
La Géographie à l'Exposition universelle et internationale de Liége, 1905. Par Dr. F. Kraentzel. (Travaux du Séminaire de Géographie de l'Université de Liége, Fasc iii.) Liége: D. Cormaux, 1905. Size 10 × 6½, pp. 36. *Illustrations.*

Medical Geography. *B.G.S. Philadelphia* 4 (1906): 29–55. **Ward.**
The Hygiene of the Zones. By Prof. R. De C. Ward.

An outline of the general relations between climate and disease.

Russia—Languages. *Petermanns M.* 51 (1905): 285–286. ———
Ergebnisse der Sprachenzählung im Russischen Reiche, 1897.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary. **K. u. K. Militärgeographisches Institut.**
Spezialkarte der österreichisch-ungarischen Monarchie und anschliessender Gebiete. Scale 1:75,000 or 1 inch to 1·2 stat. mile. Sheets (new editions): Zone 6, kol. xxviii., Mościska, 1904; zone 7, kol. xxviii., Sambor, 1904; zone 13, kol. xxxv., Darabani, 1904; zone 16, kol. iv., Zirl und Nasserieth, 1904; zone 16, kol. xxxv., Dolhasca, 1904; zone 17, kol. xxxiv., Bistricioara, 1904; zone 28, kol. xxvii., Brza Palanka, 1904. Vienna: K. u. K. Militärgeographisches Institut. *Price 1 mark each sheet.*

England and Wales. **Ordnance Survey.**
ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from April 1 to 30, 1906.

1-inch:—
In outline, 34, 44, 49, 96, 202, 204, 297. 1*s. each* (engraved).

6-inch—County Maps—(first revision):—
Brecknockshire, 43 S.W. **Cardiganshire**, 16 S.E. **Carmarthenshire**, 50 S.W. **Devonshire**, 29 S.W., 30 S.E., 36 S.E., 44 S.W., 54 N.E., 83 N.E., 93 N.E. **Lincolnshire**, 108 N.E., 134 S.W., 147 N.E., 148 N.W. **Norfolk**, 89 S.E., 91 N.E., 99 N.E., 106 N.W. **Suffolk**, 3 S.E., 9 N.E., 18 N.W. **Warwickshire**, 24 S.E., 31 S.W. 1*s each.*

25-inch—County Maps (first revision):—
Cardiganshire, XXXVIII. 16. 3*s*. XXXVII. 3, 7, 16; XXXVIII. 13, 15.

1*s*. 6*d*. *each*. **Carmarthenshire**, IV. 16; XIII. 15, 16; XIV. 13; XXII. 3, 4, 7, 8, 10, 11, 12; XXIII. 1, 5, 9; XXIV. 8; XXV. 1, 12; XXVI. 9. **Devonshire**, LI. 11, 12; LII. 1, 5, 13; CXXVII. 14, 16; CXXX. 8, 10, 12, (15 and 16); CXXXI. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16; CXXXII. 8, 9; CXXXIII. 1, 4, 5, 7, 8, 11, 13, 14; CXXXIV. 1, 5; CXXXV. 3, 4, 8; CXXXVI. 1, 3. **Lincolnshire**, LX. 2, 4, 6, 7, 8, 10, 11, 12; LXI. 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 16; LXII, 2, 3, 5, 6, 7, 9, 10, 11, 14, 15; LXXV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. **Norfolk**, IX. 8, 16; X. 1, 2, 6, 9, 11, 14, 15; XVII. 4, 8, 16; XVIII. 2, 7, 9, 10, 11, 13, 15; XXXVII. 2; XLIX. 9, 10, 11, 14, 15; LX. 4, 8, 12, 16; LXI. 1, 2, 5, 6, 7, 9, 10, 11, 13, 14, 15; LXXII. 4, 16; LXXIII, 2, 3, 6, 7, 9, 11, 13; LXXIV. 15; LXXXIV. 4; LXXXV. 1, 2, 3; LXXXVI. 3, 4, 7, 8. **Yorkshire** (First Revision of 1891 Survey), CCLX. 11, 15; CCLXII. 13; CCLXIV. 13; CCLXXIV. 11; CCLXXVII. 1, 2, 4, 5, 6, 7, 8; CCLXXVIII. 1, 5, 9, 13. 3*s*. *each*.

(*E. Stanford, London Agent.*)

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets (new editions): XVII.-6, Béthune; XVIII.-8, Cambrai; XXI.-21, Le Creusot. Paris: Ministère de l'Intérieur, Service Vicinal, 1906. *Price* 0.80 *fr. each sheet.*

Iceland. **Section Topographique de l'État-Major Général, Copenhagen.**

Carte de l'île d'Islande. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheets: 49 N.E., N.W., S.E., S.W., Vestmannaeyjar; 59 N.E., Portland; 68 S.E., Skaptártunga; 69 N.E., N.W., Hjörleifshöfdi; 77 S.E., Lómagnúpur; 78 N.E., N.W., S.E., S.W., Kirkjubæjarklaustur; 79 N.W., Grimsstadir; 87 N.E., N.W., S.E., S.W., Oeræfajökull; 88 N.E., N.W., Ingólfshöfdi; 96 S.E., Heinaberg; 97 N.E., N.W., S.E., Kálfafelsstadur; 106 S.W., Lón.—Nàgrenni Reykjavikur og Hafnarfjardar. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles.—Reykjavik. Scale 1 : 5000 or 12·7 inches to a stat. mile.—Hafnarfjordur. Scale 1 : 5000 or 12·7 inches to a stat. mile. Copenhagen: Section Topographique de l'État-Major Général, 1906. *Presented by the Chief of the Topographical Section, Copenhagen.*

The survey upon which these sheets are based was undertaken during the years 1902 04, the necessary funds being supplied partly by the Danish Government and partly by the "Landskasse" of the island itself. The map will be published on two scales, 1 : 50,000 and 1 : 100,000, the latter issue consisting of 115 sheets, while on the former scale each of these sheets is divided into four quarters, making altogether four times the number of the 1 : 100,000 scale. So far all that have been published are coast sheets on the south-east of the island, with special plans of Reykjavik with the immediate neighbourhood, and of the Westmann islands. But if the money is forthcoming, it is hoped that the survey may continue, and other sheets soon be ready for issue.

Judging from the sheets already received, the manner in which the map is to be produced leaves little to be desired. Relief of the land is shown by brown contours at 20-metre intervals, combined with vertical hachuring in the more precipitous parts. On the ice-fields and glaciers the contours are shown in blue. Special care has been taken to indicate the surface features of the land and character of the soil by carefully selected symbols and tints, and the sheets have been well drawn and artistically printed.

Russia. **Topographical Dept., General Staff, St. Petersburg.**

New Special Map of European Russia. Scale 1 : 420,000 or 1 inch to 6·6 stat. miles. Sheets (new editions): 13, 27, 80. St. Petersburg: Topographical Department of the General Staff, 1905.

ASIA.

India. **Deputy Conservator of the Port, Calcutta.**

Chart of the River Hooghly from Calcutta to Saugor, from surveys made by the officers of the River Survey Department under the direction of E. W. Petley, Deputy Conservator of the Port, 1904–1905. Scale 1 : 80,724 or 1 inch to 1·3 stat. mile. Calcutta: Deputy Conservatory of the Port, 1905. *Presented by Lieut. E. W. Petley, C.I.E., R.N., Deputy Conservator of the Port, Calcutta.*

This is a detailed and most complete chart of the Hooghly. In addition to the soundings with which the course of the river is thickly covered, the depths of water are indicated by two tints of blue, whilst sandbanks are shown in a light tint of burnt sienna. All heights are expressed in feet and refer to the level of Kidderpur Dock sill. Soundings are reduced to the levels of the zeros of the local gauges.

Japan. **Japanese Imperial Geological Survey.**

Topographical Map of Japan. Scale 1 : 200,000 or 1 inch to 3·1 stat. miles. Sheets: Susa; Yamaguchi. Tokyo: Imperial Geological Survey, 1905. *Presented by the Imperial Geological Survey of Japan.*

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet (Gold Coast): 72-O (Provisional issue without hills). London: Topographical Section, General Staff, War Office, 1906. *Price 1s. 6d. each sheet. Presented by the Director of Military Operations.*

Transvaal. **Geological Survey of the Transvaal.**

Pretoria and environs, geologically surveyed in November, December, and January, 1904–1905, by H. Kynaston, B.A., F.G.S., Director, A. L. Hall, B.A., F.G.S., and F. A. Steart, F.G.S. Scale 1 : 31,680 or 2 inches to a stat. mile. Johannesburg: Mines Department, Geological Survey of the Transvaal, 1905. *Presented by the Geological Survey of the Transvaal.*

The topography of this sheet is from surveys made in June–July, revised to November, 1900, by No. 1 Survey Section under Major H. M. Jackson, R.E., whilst the geological colouring is from the surveys of November, December, and January, 1904–1905, by Messrs. H. Kynaston, B.A., F.G.S., A. L. Hall, B.A., F.G.S., and F. A. Steart, F.G.S. Although an excellent separate plan of Pretoria and its environs, the sheet really forms part of the large geological survey of the Transvaal which has been commenced.

Tunis. **Service Géographique de l'Armée, Paris.**

Carte topographique de l'Tunisie. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheet: Environs du Kef. *Price* 1.50 *fr. each sheet.* Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheet: LXII., Maknassy. *Price* 1.20 *fr. each sheet.* Paris: Service Géographique de l'Armée, [1906].

ARCTIC OCEAN.

Barents Sea. **Breitfuss and Smirnow.**

Carte bathymétrique de la mer Barenz par L. Breitfuss et A. Smirnow, 1905. Scale 1 : 2,500,000 or 1 inch to 39·4 stat. miles. St. Petersburg, 1906. *Presented by Dr. L. Breitfuss.*

A chart of the Kara sea, giving depths in figures (metres) and four different tints of blue at 100-metre intervals from 0 to 400 metres, and a darker tint for depths that exceed the latter figure. The valuable work done by the Murman expedition is clearly indicated by the numerous additional soundings given here for the first time, and which greatly increases our knowledge of this part of the north polar basin. Soundings taken by other expeditions are distinguished by their being underlined and by letters placed near them. Attached to the chart is a supplement giving soundings taken by the "Willem Barents" and Weyprecht expedition.

GENERAL.

World. **Bartholomew.**

Atlas of the World's Commerce A new series of maps with descriptive text and diagrams, showing products, imports, exports, commercial conditions, and economic statistics of the countries of the world. Compiled from the latest official returns at the Edinburgh Geographical Institute, and edited by J. G. Bartholomew, F.R.G.S., F.R.S.E. Parts ii., iii., and iv. London: George Newnes, Limited, [1906]. *Price 6d. net each part. Presented by the Publisher.*

The contents of these three parts of this atlas are as follows:—Part ii. Plates: 77, Sugar crop; 78, 79, Sugar-growing countries; 80, Sugar statistics; 109, Cotton supply; 110, 111, Cotton-growing countries; 112, Cotton statistics. Part iii. Plates: 81, Tea crop; 82, 83, Tea-growing countries; 84, Tea statistics; 161, Tobacco supply; 162, 163, Tobacco-growing countries; 164, Tobacco statistics. Part iv. Plates: 89, Wine supply; 90, 91, Wine-growing countries; 92, Wine statistics; 125, Iron production; 126, 127, Iron-mining countries; 128, Iron statistics. Each part contains a continuation of Mr. Taylor's list of commodities of commerce, and upon the back of each of the plates there are interesting diagrams and statistical information referring to the subjects dealt with.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during January and February, 1906. *Presented by the Hydrographer, Admiralty.*

No.	Inches.	
3547 m	= 1·0	Scotland, east coast:—Logie head to Nairn. 3s.
3538 m	= 1·45	Norway, west coast:—Varholmen to Tiötta. 3s.
2680 m	= 1·45	Spain, south-west coast:—Lagos bay and approaches. 2s.
3579 m	= 0·1	Cuba, western portion (Preliminary issue). 2s.
3580 m	= 0·1	Cuba, eastern portion (Preliminary issue). 3s.
3549 m	= 0·7	South America, east coast:—Uruguay river. Parts I. and II. Juncal island to Concepcion del Uruguay. 3s.
3550 m	= 1·4	South America, east coast:—Uruguay river. Parts III., IV., and V. Concepcion del Uruguay to Concordia. 3s.
3543 m	= 0·14	Malay peninsula:—Approaches to Singapore. 3s.
2674 m	= var.	Anchorages on south coast of Celebes. 2s.
1527 m	= 1·99	Japan:—Southern approaches to Hirado Kaikyo. 3s.
2559 m	= 1·99	New Zealand:—Great Barrier island, ports and anchorages. 2s.
1998 m	= 1·99	New Zealand:—Omaha bay to Tiri-Tiri Matangi, including Kawau bay. 3s.
3534 m	= {2·99, 7·26}	Harbours and anchorages in the Sandwich islands:—Maalaea bay, Kahului harbour. 2s.
2665		France, west coast: Bidassoa river to pointe d'Arcachon. Plan added:—Higuer road.
2804		Chile:—Plans on the west coast of Patagonia. Plan added:—Port Muñoz Gamero
2248		Mexico, south-west coast:—Anchorages in the Gulf of California. New plan:—San Lorenzo channel.
674 m	= 6·5	Africa, east coast:—Dar es Salaam and adjoining anchorages. New plan:—Dar es Salaam harbour.
100*a* m	= 3·6	Africa, north-east coast:—Rás Galwéni to Ras Hafún. Plan added:—Oloch and Damo anchorages.
750		India, west coast:—Sheet xii. New plan:—Alleppi road.
2196 m	= 3·0	Celebes:—Sketch plan of anchorages in southern part of. New plan:—Labuan Blanda.
957 m	= {3·63, 7·25}	Ports in the Philippine islands. Plans added:—Port Nasipit, Kagayan anchorage.
1472		Plans on the south-west coast of Australia. New plan:—Koombanah bay.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.	Cancelled by	No.
87 Cape St. Vincent to strait of Gibraltar. Plan on this sheet. Lagos bay	New plan. Lagos bay and approaches	2680
2579 Cuba, western portion.	Preliminary Chart. Cuba, western portion	2579
2580 Cuba, eastern portion.	Preliminary chart. Cuba, eastern portion	2580
2991 River Congo. Kissanga to Camoens point.	. . . .	—
3161 River Congo. Camoens point to Princes island.	. . . .	—
9 Arabian sea. Winds and currents during the S.W. monsoon.	. . . .	—
2674 Anchorages on south coast of Celebes.	New chart. Anchorages on south coast of Celebes . .	2674
2559 New Zealand. Great Barrier island ports and anchorages.	New chart Great Barrier island ports and anchorages	2559
1998 New Zealand. Kawau island. 1094 Mahurangi harbour and approaches.	New chart. Omaha bay to Tiri-Tiri Matangi, including Kawau bay	1998

No.		Cancelled by	No.
1377	Harbours and anchorages in Sandwich islands. Plan on this sheet. Kalului harbour.	New chart. Harbours and anchorages in the Sandwich islands. Maalaca bay. Kahului harbour	3534

Erratum.—Chart No. 1982c Parana river, sheet 3, is not cancelled by Chart No. 3558, as shown in Bi-monthly List for November and December, 1905.

Charts that have received Important Corrections.

No. 1178, England, west coast:—Trevose head to Bull point. 2496, Scotland, west coast:—Sleat sound. 1185, England, east coast:—River Thames, Sea reach. 2180*a*, Orkney islands, northern portion. 2180*b*, Orkney islands, southern portion. 2910, France, west coast:—Entrance to Gironde river. 79, Spain, north coast:—Ferrol, Coruña and Betanzos inlets. 72, Spain, south-west coast:—Entrance to rivers Tinto and Odiel, Port of Huelva. 1195, Spain, east coast:—Approach to port of Barcelona. 2378, Black sea:—Bug river. 2205, Black sea:—Kertch strait. 1638, Gulf of Mexico:—Breton sound to Derniere island. 546, South America, east coast:—Espiritu Santo bay and Port Victoria. 1337, South America, Magellan strait:—First narrows to Sandy point. 631, Chile:—Smyth channel from south entrance to Fortune bay; 1008, Africa, east coast:—Pungue river, Beira harbour. 6*a*, Gulf of Aden, sheet i.:—Eastern portion, including Sokotra island. 6*b*, Gulf of Aden, sheet ii.:—western portion. 100*b*, Gulf of Aden, Ras Galwéni to Ras Hafun, sheet ii. 2023, Malacca strait, Singapore:—Keppel (New) harbour. 1995, Malacca strait:—Singapore road. 2760, Sumatra, west coast:—Acheh head to Tyingkok bay. 941*b*, Eastern archipelago, Western portion, Sheet ii. 942*a*, Eastern archipelago, Eastern portion, Sheet i. 971, Philippine islands:—Semirara, Ilin, and Ambolon islands, etc. 1269, Cochin China:—Saïgon or Don nai river. 1601, China, north-east coast:—Wusung river. 3225, Japan:—Simonoseki strait to Maruyama zaki; 1674, Australia, east coast:—Brisbane river. 2123, New Guinea, sheet vii.:—Orangerie bay to Bramble haven. 2124, New Guinea, sheet viii.:—Louisiade archipelago, Bramble haven to Rossel island.

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for May, 1906. London: Meteorological Office, 1906. *Price 6d. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for May, 1906. Washington: Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for May, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Bahamas. **Allen and Barbour.**

Sixty photographs of the Bahamas, taken by Dr. G. M. Allen and T. Barbour, Esq., 1904. *Presented by T. Barbour, Esq.*

These photographs were taken during Messrs. Allen and Barbour's zoological expedition to the northern part of the Bahama group, an account of which is given in their "Narrative of a Trip to the Bahamas." The vegetation types are specially interesting.

Great Abaco:—(1 and 6) Narrow path through the mangroves; (2) Water-worn undermined shore; (3) Undermined shore of Æolian limestone; (4) The camera pointed up against the clouds; (5) Dr. G. M. Allen collecting; (7) Our collecting headquarters; (8) West shore of Great Abaco; (9) The Bahama wild duck. Little Abaco:—(10 and 13) A sting-a-ree, *Dasybatis Lastata;* (11 and 15) Limestone cave; (12) *Liocephalus Carinatus;* (14) A cave; (16) Limestone cliffs; (17) Sisal plantation; (18) Herons hiding on nest. New Providence Island:—(19) Street in Banestown; (20 and 21) Interior vegetation; (22 and 23) Roadside vegetation; (24) Loading live turtles on S.S. *Orizaba*, Nassau; (25) Live young flamingoes for sale as food at

Nassau; (26) Residence of R. S. Johnstone, colonial magistrate, Nassau; (27) Near water-front, Nassau; (28) Royal palms near Nassau; (29) Loading apparatus on schooner *William H. Albury*, Nassau; (30) Giant silk cotton tree, Nassau; (31 and 32) Tree cacti near Nassau; (33) A garden near Nassau; (34) Coconut grove, Nassau; (35–37) Inland vegetation near Nassau; (38) Government House, Nassau; (39) Negro's cabin near Nassau Grand Bahama:—(40) Mangroves; (41 and 42) Inland vegetation; (43) The outer swamp on north shore of Grand Bahama; (44) Tame flamingo; (45) Mr. Owen Bryant and Mr. T. Barbour. Great Sale Cay:—(46) Mangrove vegetation; (47) Cormorants' nests in mangroves; (48) Shark, *Galeocerdo tigrinum*; (49) Two herons at their nest, John Downer Cay; (50) Shore vegetation, Great Guana Cay; (51) Collecting birds at Moraine Cay; (52) *Carcharias Macubpeinis*, Strangers Cay; (53) Limestone caves, Lubber's Quarters Cay; (54) Shell-tortoise and flamingo; (55) Part of our crew and a tiger shark; (56) Breakfast while under way; (57 and 59) Dredging for zoological specimens among the northern Bahamas; (58) A tame frigate bird; (60) A tame man-o'-war hawk; (61) Mr. Owen Bryant.

Bombay Presidency. **Varley.**

Ten photographs of the Bombay Presidency, taken by F. G. Varley, Esq. *Presented by F. G. Varley, Esq., M.A.*

(1 and 2) Bhusaval, a station on the Great Indian Peninsula Railway; (3) The Railway Institute, Bhusaval; (4 and 5) Scenes in a nullah, dry season; (6) Temple in Ahmednagar; (7) Giving away the rent-rolls to village officers, Ahmednagar; (8) Source of the Godaveri; (9) River front at Nasik; (10) Toranmal, a plateau in the Satpuras.

Somaliland. **Swayne.**

Fifty-six photographs of Somaliland, taken by Miss Frances L. Swayne. *Presented by Miss Frances L. Swayne.*

Miss Swayne visited Somaliland in the early part of the present year, and has brought back with her a very good little set of photographs, copies of which she has added to our collection. As will be seen by the titles, the subjects are well selected and typical.

(1) View of Berbera from the harbour; (2) Camp under date palms at Dubar; (3) Fig tree at Bihendula; (4) Gorge at Bihendula; (5) Tree at Lower Sheikh; (6) Some of the Commissioner's camel corps; (7) Two camel sowars; (8) Somali sheep and Persian ram; (9) Somali sheep; (10) Commissioner's camp at Sheikh; (11) Camels driven by girl; (12) Native caravan; (13–15) Camels with European baggage; (16) Euphorbia trees near Commissioner's camp, Sheikh; (17) Glade near militia camp, Sheikh; (18) Camel waiting for the mail-bag, Sheikh; (19) Somali graves, Sheikh, (20) Burden camels feeding on thorn-bushes; (21) Group of servants at Sheikh; (22) Sowars; (23 and 24) Militiamen; (25) Kessaldar Major Musa Farah; (26 and 27) Head camp-man; (28) Head camp-man preparing to take off his saddle, (29) Aakar, Ayal Yunis sub-tribe; (30) Girl, Ayal Yunis sub-tribe, (31) Women and girls picking up sticks; (32) Woman gathering sticks; (33) Woman and baby; (34) Four men; (35) An old man; (36) Abyssinian gardener; (37 and 38) Somalis making cedar walking-sticks; (39) Group of Somalis; (40) Group of Habr Yunis; (41) Inside a "karia;" (42 and 43) Boy minding his own calves; (44) Somali in plaid tobe; (45) Camp within 600 feet of the summit of Waggar, Golis range; (46) Servants' quarters at Waggar; (47) Camp at Dara Ass; (50) View from Dara Ass, looking west; (51) View from Dara Ass, looking south-west; (52) View near Dara Ass camp; (53 and 54) Solitary cedar near Dara Ass camp; (55) View about half a mile from Dara Ass; (56) Specimen of road between Dara Ass and Sheikh.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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